Exploring the gaps between expectations and outcomes in hip and knee arthroplasty

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THE EXPECT STUDY

FREDERIQUE HAFKAMP

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The EXPECT-study

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“ Aut viam inveniam aut faciam” - Hannibal

TABLE OF CONTENTS

CHAPTER 1

GENERAL INTRODUCTION

OSTEOARTHRITIS

Osteoarthritis (OA) is the most common chronic degenerative joint disease in the world [1,2]. OA is characterized by damage and intermittent progressive loss of articular cartilage [3-6]. In healthy people, this connective tissue ensures coverage between joints, prevents friction, and diminishes the impact of weight on the joint [6]. In patients with OA, specific cells come into imbalance, which eventually leads to greater degradation and less synthesis of cartilage [6]. Moreover, this loss of cartilage in OA is accompanied by remodeling of the subchondral bone (i.e., the layer of bone tissue directly beneath the cartilage layer), formation of osteophytes (i.e., outgrowths of the bone), hypermobility of ligaments and inflammation [4-7] (Figure 1).

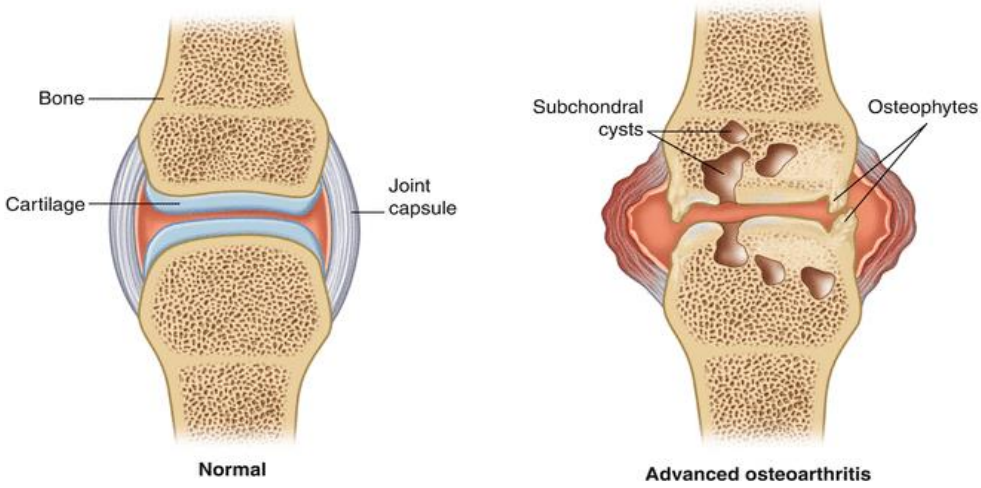

Figure 1. *A normal joint as compared to a joint with advanced osteoarthritis. Adapted from Cividino, & O'Neill.* [7]

Although OA can affect most joints within the body, it is predominantly found in the hips and knees [1,2]. Patients frequently have trouble with walking, climbing stairs, and general movement [1]. Patients usually experience pain, muscle weakness, stiffness and swelling, leading to substantial limitations and disability in activities of daily living [1-3]. Therefore, the impact of hip and knee OA is much greater compared to other forms of OA [3]. The disease involves all tissues of the affected joint and can be regarded as a

disease similar to cardiac failure, as it leads to failure of the organ, that is, the joint itself [3]. Furthermore, this disease is ranked 6 on the list of leading causes of disability in the world and is within the top 5 of leading global causes of years lost due to disability in high income countries [8]. Approximately 1 billion euros, which is 1.2% of the total healthcare costs per year in the Netherlands, are spend on care for hip and knee OA [9].

Diagnosis

Structural OA can be detected using radiographic data [10]. Notwithstanding, most patients only seek medical assistance when they have symptomatic OA, which is mostly in an advanced stage of structural OA [4,11,12]. In addition, there may be a discrepancy between radiographic features and reported physical symptoms. Deterioration of pain, for example, could not always be matched with structural changes based on radiographic data [1]. Therefore, other diagnostic criteria could additionally be used to diagnose clinical OA, as, for example: hip or knee pain for most days of the previous month, crepitus during movement, startup complaints, limited rotation or flexion of the joint, morning stiffness and swelling [11,13]. Evidence for OA could then also be supplemented with an ESR-test, which is able to detect inflammation in the body [11,13].

Epidemiology

Within the Netherlands, approximately 1 out of 10 people (i.e., almost 1,400,000 individuals) is diagnosed with some form of OA [14]. The vast majority of this number concerns hip and knee OA. In 2017, almost 432,000 patients had hip OA and even more patients had knee OA (i.e., 642,500). In that year, the number of OA patients increased with 31,000 new diagnoses of hip OA and almost 50,000 new diagnoses of knee OA. During the last 30 years, the prevalence of OA has increased with 40% for women and 55% for men [15] and it is expected that the prevalence of OA will rise even further, due to increasing obesity rates and the increasing elderly population [15-17].

Risk factors

OA is a multifactorial disease, related to both systemic and biomechanical factors [1,3,4]. The most robust systemic factor related to the development of OA seems age [1,3,17]. The prevalence of both symptomatic and structural OA rises with age [3], affecting 10% of men and 18% of women over 60 years of age [17]. From the age of 50 years onwards, the incidence of women diagnosed with knee OA rises even faster than the incidence for men [3]. Moreover, the progression of hip symptoms is much faster in women than in men [3]. The relationship between age, gender and the development of OA could possibly be explained by other systemic and biomechanical factors, for example, estrogen deficiency in women, obesity, increased instability, and less resilience of cartilage related to older age [3]. Other factors, which could increase the risk of developing OA, are, for example, previous trauma, a physically demanding job, and genetics [1,3,4].

Treatment

There currently is no cure for OA. Therefore, relief of complaints is the foremost goal of treatment [4,18]. Symptoms could be treated through lifestyle modification. Patient should obtain increased muscle strength through exercise and obese patients are advised to lose weight. Pain control could thereby be achieved by pharmaceutical therapy consisting of paracetamol and (non-steroid) anti-inflammatory drugs [4,18]. In end-stage OA, when complaints continue to exist and structural OA worsens, joint replacement is commonly used as treatment [19-24].

Joint replacement

The number of total knee arthroplasties (TKA) and total hip arthroplasties (THA) performed is rising. Approximately 30,000 patients per year, in the Netherlands, receive joint replacement as treatment for their knee or hip OA [25-27] and it is expected that this number will increase with at least 150% within the next couple of years [16,25,28]. Most patients are between age 65 and 84 when receiving joint replacement. Yet, the prevalence of younger patients receiving joint replacement is increasing [20]. Joint replacement, in history, was seen as a last resort for patients with OA [20]. However, as

complication risks diminished and outcomes improved, more patients seemed eligible for TKA or THA.

From a clinical perspective, TKA and THA are highly successful treatment options, even though hip patients report higher and faster improvement rates and less residual pain after surgery than knee patients [23,29-33]. Both hip and knee patients improve in physical function and less than 2% of patients need revision within one year [21,22,24,27,34-37]. Moreover, more than 94% of all patients have a hip or knee prosthesis that survives more than 9 years [27].

PATIENT REPORTED OUTCOMES (PROs)

Nevertheless, success of treatment nowadays no longer only depends on the clinical perspective, but also on the patients' perspective [38-40]. Pain, (frequency and severity of) other symptoms, function, and satisfaction have become increasingly relevant in determining the outcomes of surgery, aside from clinical parameters [41,42]. As some of these parameters could only be obtained from the patient itself [42], PROs could then be used to determine the outcome of treatment from a patient point of view [43]. This patient point of view on outcomes of treatment partly depends on what activities patients are able or unable to perform [44], which is in contrast to the physicians' view, who base their rating of success on clinical or radiographic improvement, implant survivorship, and postoperative range of motion [44,45]. Therefore, the concerns and priorities of patients and physicians may differ, which could explain why clinical outcomes are mostly not aligned with PROs [45]. Indeed, some patients report a bad clinical outcome, in terms of pain and function, but may report good levels of satisfaction with their surgical outcomes and vice versa [38]. However, since the foremost outcome of surgical treatment as TKA or THA is relief of complaints and improvement in quality of life, instead of curing or survival [4,18], focusing on the patients' perspective is especially important [42].

Patient satisfaction

The term 'patient satisfaction' was first construed by Ware et al., [46] in 1983, as "*a personal appraisal of the healthcare system and its' providers*", which is both a result of external factors (e.g., the actual healthcare system) and is determined by internal factors (e.g., personal preferences and expectations of the patient) [46-48]. Studies examining the influence of patient satisfaction on outcomes found that higher patient satisfaction could lead to greater compliance, better follow-up, and longevity [49]. Patient dissatisfaction, however, could result in nonadherence with medication and advice, and delayed or insufficient physical improvement [38,49,50]. Considering that patient satisfaction is both a result of external and internal factors, it could therefore either be improved by targeting certain aspects of healthcare or by targeting specific preferences or expectations of patients [46].

Satisfaction with outcome

Patient satisfaction is a multidimensional construct, which could be related to different categories [46]. These categories are, for example satisfaction with: interpersonal manners (i.e., how doctors interact with patients), availability (i.e., the presence of resources) or outcomes (i.e., the results of medical interventions) [46]. It has been found that patients and physicians often differ in the level of satisfaction with outcomes of joint replacement [45,51-54]. Therefore, satisfaction with outcomes of surgery has been denoted as one of the PROs that should be administered in joint arthroplasty registries [41].

Patients are generally less satisfied than physicians with outcomes of TKA and THA [51-54]. Approximately a quarter of patients show some degree of dissatisfaction after joint replacement [19,38,52,55-57]. The proportion of dissatisfied patients is even higher for knee patients [19,38,52,55-57], who generally obtain less favorable outcomes than hip patients [23,29-33,58]. Residual pain and postoperative impairment in function seem important factors for dissatisfaction [59]. Nonetheless, these factors could not explain all variance in satisfaction rates, because some patients might agree that residual symptoms are unavoidable [51]. Residual pain or limitations in function in these patients will

consequently not negatively affect their satisfaction level when these levels are close to expected levels, while in patients who expected that their pain and function would have gone back to normal, it will [51]. According to the assimilation-contrast theory [60] (see Figure 2), the larger the gap between expectations and the eventual evaluation of outcomes, the more likely patients are to acknowledge these differences, which could result in dissatisfaction (Figure 2). This underscores the relevance of discussing patients' expectations of outcome of treatment preoperatively [51,52,55,61].

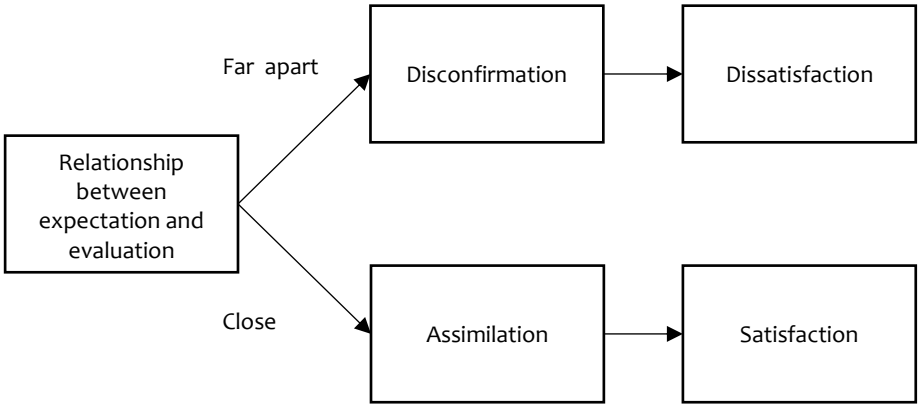

Figure 2. *Assimilation-contrast model. Adapted from Waljee et al.* [60]

EXPECTATIONS

Expectations could focus on three distinct areas: (1) what the individual thinks *will* be the result, (2) what the individual *wants* to be the result, and (3) what the individual thinks *should* be the result [62]. Patients' outcome expectations, in particular, concern 'a belief that certain actions will achieve particular outcomes' [63]. These expectations are, in essential, an anticipation of what will occur after surgery [61]. By having these expectations, patients are more or less able to shape the results of surgery. Optimistic realistic expectations, for example, are thought to relate to more successful recovery and better general health outcomes [61,64-70]. These non-specific treatment effects are common in treatment for conditions with high levels of pain [70], like osteoarthritis [1-3]. Kirsch et al. [71] explained, in their response-expectancy theory, that what patients experience might actually be a result of what they expected to experience. For

example, TKA or THA patients with high expectations may be motivated to obtain the expected result in rehabilitation [72], and might actually achieve these results through some sort of self-fulfilling prophecy [73]. Additionally, patients might focus more on the anticipated result and might therefore neglect other aspects of the outcome, thereby diminishing anxiety and relieving pain [74].

Nevertheless, the anticipation of a likely result could be erroneous and therefore stay unfulfilled. In fact, up to 50% of TKA and THA patients have unrealistically high expectations of outcomes of joint replacement, which remain unfulfilled [51,75-78]. For example, even though, in a sample of TKA patients, 85% of patients expected to be relieved of pain after treatment, only 43% of patients achieved a pain-free status [75]. Moreover, although 52% of patients expected total improvement in function, only 43% of patients had no limitations in function after surgery [75]. This disbalance between expectations and outcomes could relate to patient dissatisfaction, considering that patients' expectations will strongly influence the interpretation of the outcome of their joint replacement and their ultimate level of satisfaction [78]. This is also expressed in the expectation-confirmation theory [79], which hypothesizes that expectations will lead to dissatisfaction when the perceived performance (which might be patients' postoperative functional status) is not in line with the patients' expectations (see Figure 3). Therefore, not preoperative expectations per se, but unfulfillment of these unrealistically high expectations are denoted in the literature as the most influential predictor of patient dissatisfaction [22,31,77,80-83].

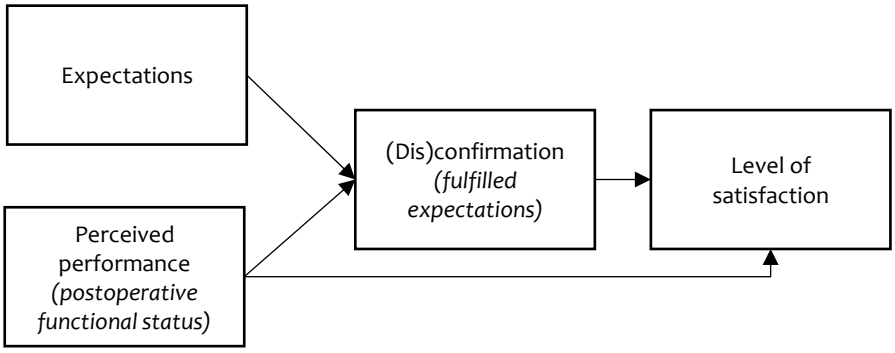

Figure 3. *Expectation-confirmation model. Adapted from Oliver et al.* [79]

Patients' expectations could be associated with certain sociodemographic (e.g., age, sex and social economic status) [68,84-97] and clinical (e.g., pain) factors, despite inconclusive findings regarding the direction and strength of the factors [81,85,87,90,92,95-100]. Likewise, outcome expectations are also found to be guided by sources outside the self, such as friends, family, media, and previous treatment [63,101,102]. In fact, approximately 40% of patients' expectations are thought to be formed within the medical consultation [44,101,103-106]. Nevertheless, expectations are rarely explicitly discussed during a medical consultation [99,107-110]. It might therefore be that not only explicit verbal aspects of the doctor-patient communication are of influence on the formation of expectations [111], as we know that even when topics are non-discussed, they could also be picked up during interaction [112-114]. These factors, relating to patients' expectations, are acknowledged within the conceptual framework of Crow et al., [63] (see Figure 4) and should be emphasized when examining the origin of patients' expectations.

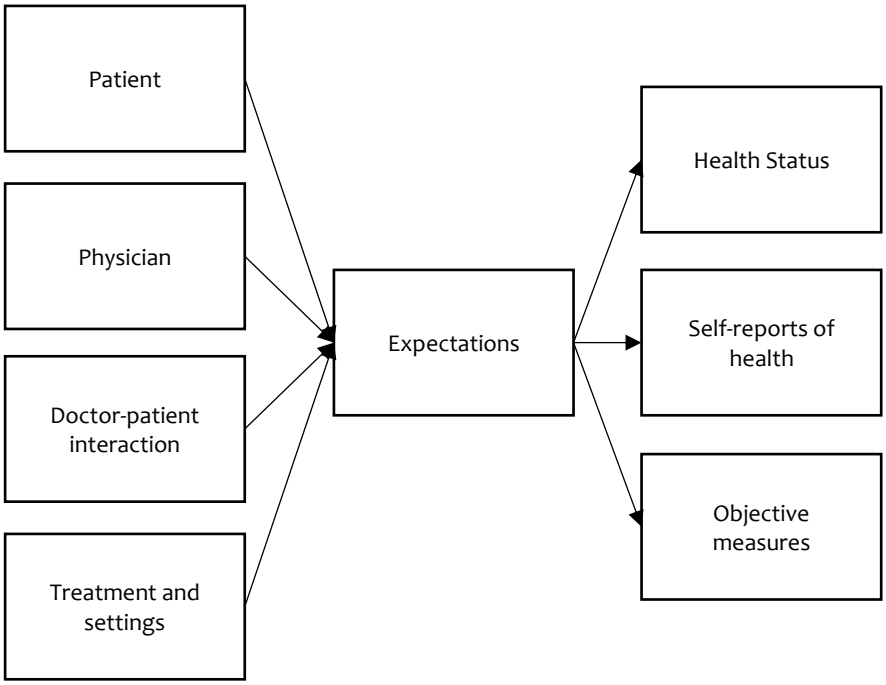

Figure 4. *Conceptual framework examining predictors and outcomes of expectations. Adapted from Crow et al.* [63]

THE EXPECT-STUDY

The EXPECT-study is a prospective observational study started in November 2016. The study examines the relationship between expectations and satisfaction in hip and knee osteoarthritis patients up until one year post-surgery with both quantitative and qualitative methods. Within the study, audio- and video recordings of the medical consultation are used, as well as questionnaire data. This study is conducted at the Department of Orthopedics of the Elisabeth-TweeSteden Hospital, Tilburg, the Netherlands. The study is conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act (WMO), and was approved by the local Medical Ethical Review Board. All included patients gave written informed consent.

Patients who were referred by their general practitioner to the Department of Orthopedics with symptoms of osteoarthritis, including pain and stiffness during rest and activities, leading to limitations in activities of daily living, were eligible for inclusion in the study. All patients were, at least 48 hours before onset of the medical consultation, informed about the purpose and content of the study. Patients were consecutively included at first encounter with the physician and were asked to complete the first questionnaire (T0) directly upon arrival at the hospital, indicating their expectations of outcome of treatment. In addition, physicians were asked to complete the same questionnaire directly after consultation, thereby indicating what their expectations for treatment outcomes for those particular patients would be. At the start of the medical consultation, patients were placed in an, for this study, equipped consultation room where cameras, desks, and chairs were placed in a particular and consistent manner. Recording of the consultation started when patient and orthopedic surgeon were seated in the consultation room, and ended when the physician closes the consultation. All recorded medical consultations were transcribed verbatim.

Patients received questionnaires at either one or six additional time points, through post mail or e-mail. Patients who were scheduled for conservative treatment only received the second questionnaire one week post-consultation (T1), while patients planned or scheduled for TKA or THA received also questionnaires one week pre surgery (T2), five weeks post-surgery (T3), three months post-surgery (T4), six months post-surgery (T5) and one year post-surgery (T6) (see Table 1, Figure 5).

Table 1. *Questionnaires completed by hip and knee patients.*

	Pre-consultation	Pre-surgery		Post-surgery			
	T0	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**
Sociodemographic and clinical information		X					
HR(F)ES/K(F)RES	X	X	X	X	X	X	X
Information collection*			X				
HOOS/KOOS		X		X	X	X	X
Satisfaction*				X	X	X	X

Abbreviations: HRES: Hip Replacement Expectations Survey, KRES: Knee Replacement Expectations Survey, HR(F)ES: Hip Replacement Fulfillment Expectations Survey, KR(F)ES: Knee Replacement Fulfillment Expectations Survey, HOOS: Hip disability and Osteoarthritis Outcome scale, KOOS: Knee injury and Osteoarthritis Outcome Score. Note: *self-constructed questionnaires.

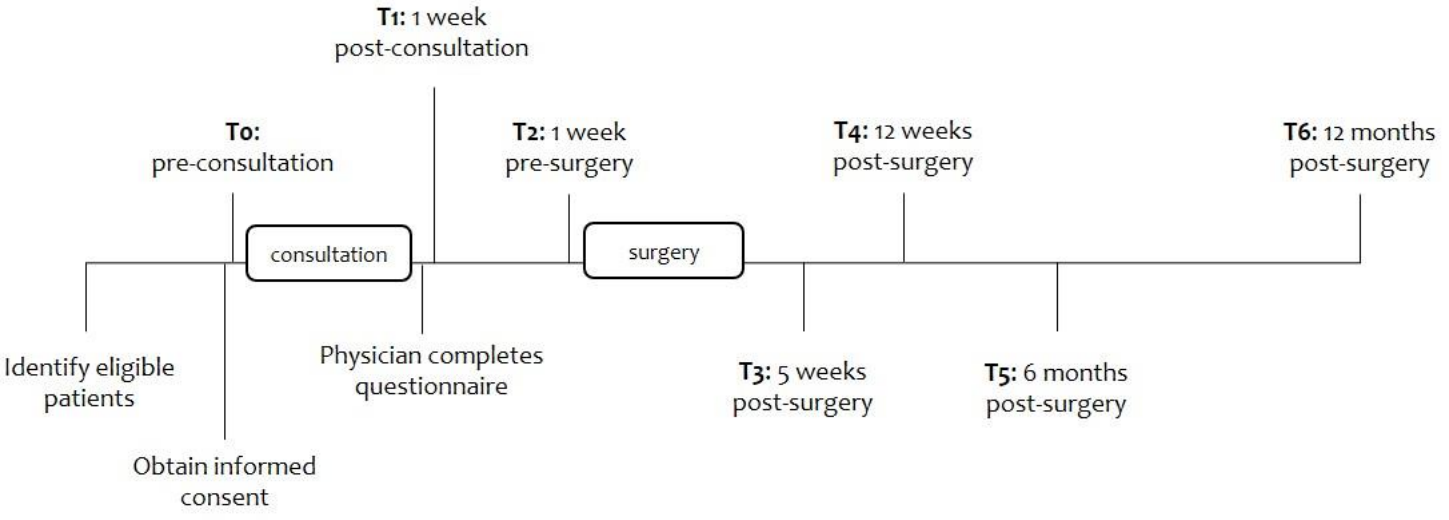

Figure 5. *Timeline of questionnaires in EXPECT-study*

AIMS AND OUTLINE OF THE DISSERTATION

Summarizing, PROs have become more important in evaluating the outcomes of TKA and THA treatment. Nevertheless, patients and physicians often differ in their opinion on the success of surgery. A substantial part of patients is dissatisfied and even though findings in the literature emphasized the relationship between unfulfilled expectations and dissatisfaction, the exact origin, prevalence and correlates of dissatisfaction in TKA and THA patients remain unclear. Moreover, it is, to our knowledge, largely unknown how patients' expectations are formed and how they relate to subjective as well as objective treatment outcomes. The overall aim of this dissertation is, therefore, to enhance the understanding of (the relationship between) patients' expectations and satisfaction in orthopedic hip and knee patients, and their relationship with surgical outcomes. The chapters of this dissertation are in line with a proposed conceptual model, which is a refinement and extension of the previously mentioned models, findings and theories of, among others, Waljee et al. [60], Kirsch et al. [71], Oliver et al. [79], and Crow et al. [63] (see Figure 6).

The first part of this dissertation is devoted to describing (the origin of) patients' expectations. **Chapter 2** aims to identify and characterize different subgroups of osteoarthritis patients and to examine whether possible information sources, certain sociodemographic, and clinical factors were associated with expectations. **Chapter 3** focuses on one of the possible sources of expectations outside of the patient's self, which is word use during the first medical consultation. **Chapter 4** aims to investigate the broader aspect of interactional patterns within medical consultations, which could be associated with the formation of expectations, using qualitative conversation analysis. The last chapter in this part, **Chapter 5**, aims to compare patients' and physicians' expectations and to explore the origin of non-alignment in expectations.

The second part of this dissertation focuses on PROs. Firstly, **chapter 6** examines the relationship between physicians' expectations and patients' expectations and surgical outcomes up to six months post-surgery. In addition, a possible mediation effect of patients' expectations on the relationship between physicians' expectations and outcomes is investigated. **Chapter 7** aims to systematically review all studies that have been performed on the relationship between (fulfillment of) expectations and satisfaction with outcome in TKA and THA patients in order to determine what connection (fulfilled) expectations and satisfaction with outcome have in these patient groups. In addition, **chapter 8** examines whether the results of the systematic review could be replicated in our sample, by considering patients' satisfaction rates up until one year post-surgery. Moreover, it aims to determine how (fulfilled) expectations could possibly mediate or moderate the relationship between expectations and satisfaction with outcome.

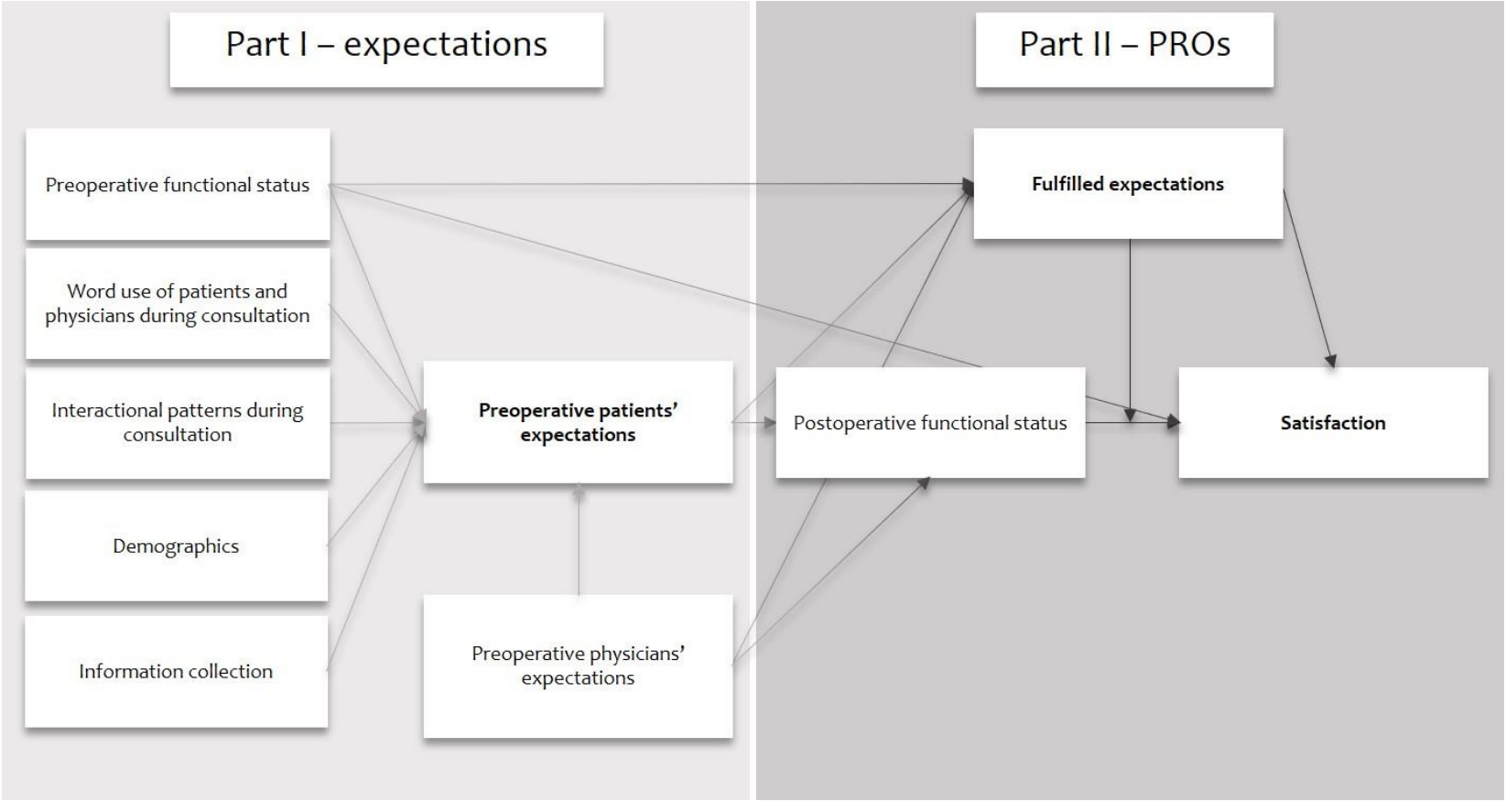

Figure 6. *Proposed model for the two parts regarding the relationship between expectations and patient reported outcomes*

PART I

CHAPTER 2

CHARACTERIZING PATIENTS' EXPECTATIONS IN HIP AND KNEE OSTEOARTHRITIS

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Quality of Life Research, 2020.

ABSTRACT

Introduction – Previous research reported conflicting findings regarding the association of sociodemographic and clinical variables with expectations for surgical outcomes. The current study aimed to identify and characterize different subgroups of osteoarthritis patients with respect to amount and level of expectations, and to examine factors that are associated with expectations.

Methods – Hip and knee patients (*n* = 287) completed a questionnaire 1 week post consultation. Linear regression analyses were performed to examine whether sociodemographic (e.g., age, sex) and clinical factors (e.g., pain, function) were associated with expectations. Latent Class Analysis (LCA) was used to identify different subgroups and the step3 method was conducted to assess subgroup characteristics.

Results – Mean age of patients was 70 years (SD = 8) and 57% of patients was female. Most improvement was expected in walking ability and pain relief. Higher expectations were associated with younger age, male sex, and functional disability. Both hip and knee patients could be classified into three subgroups. These subgroups differed significantly on pain and other symptoms, and functional disability.

Conclusion – Both hip and knee patients reported pain and other osteoarthritis symptoms and functional disability and consequently had high expectations in these areas for treatment outcomes. Higher expectations were characterized by more pain, more symptoms, and more functional disability. These insights could guide physicians in the discussion of expectations during consultation.

INTRODUCTION

In the United States, the total number of total knee arthroplasties (TKA) and total hip arthroplasties (THA) performed has increased in the last 20 years to a total of 4.7 million and 2.5 million, respectively [115,116]. While at least 90% of patients improve in clinical outcomes after surgery, such as improved function [19-24], up to 30% of the patients is dissatisfied with the results of surgery [19,38,52,55-57,117]. Although clinical outcomes usually serve as one of the criteria of treatment success, they are not the best predictor of satisfaction (e.g. [77,118]). In fact, the most robust correlate of satisfaction proves to be fulfilled expectations [19,31,52,55,77,78,82,83,101,119-122].

Arthroplasty patients typically have expectations with regard to pain relief, improved mobility, and quality of life [51,75,77,78]. Appropriate expectations, in general, are related to more successful recovery [68,72,123,124]. However, patients with unrealistically expectations may be prone to dissatisfaction and a low health-related quality of life due to unfulfilled expectations following TKA and THA [123]. Unfortunately, unrealistic expectations are not uncommon. As much as 50% of patients have too optimistic expectations of the results of TKA or THA [51,75-78].

Some studies report that certain clinical and sociodemographic factors are associated with the degree of expectations. Pain [81,90,97], low functional status [81,95,99,100], and low physical health [81,85,92,95] were associated with high patient expectations. In addition, young [84,85,87,89-91,93,97] male [84,85,87,95] patients are reported to have high expectations. In contrast, patients with a low socioeconomic status [68,89] usually have few and low expectations. However, contradicting evidence exists in which, for example not male, but female patients [68,125], and not young, but older patients [94,95] are prone to having high expectations. Moreover, several studies reported no association between expectations and sex [80,94,97,101], health [80], or social economic status [93,94]. Furthermore, the relationship between clinical or sociodemographic factors and expectations is, to our knowledge, often examined in knee patients [81,84,85,87,90,91,97] and only sporadically in hip patients [68,89,95]. Therefore, it is not known whether the findings in knee patients could be generalized to hip patients.

This observational study is, to our knowledge, the first to use latent class analysis (LCA) to identify and characterize different subgroups of patients based on individual differences in types of expectations. We aimed to (1) identify factors associated with orthopedic hip and knee patient expectations. In addition, we used LCA to (2) identify different subgroups of patients based on individual differences in types of expectations. Moreover, we examined (3) how subgroups may be characterized by different sociodemographic and clinical factors. Obtaining more insight in the aspects that are associated with level of expectations could ultimately guide us in identifying patients at risk of insufficient recovery or dissatisfaction. Patients who are at risk of having too low or too high expectations could be targeted for exploration and discussion of their expectations during medical consultation aiding them in developing realistic expectations [52,55,102]. Although expectations are rarely explicitly discussed during medical consultation [99], insight in patients' characteristics and the relationship with level of expectations could provide physicians with a starting point to, and guide them in, discussing their expectations during consultation.

METHODS

Data for this paper were collected as part of the EXPECT-study, which is a prospective cohort study of osteoarthritis patients at the Department of Orthopedics of the ETZ (Elisabeth-TweeSteden Ziekenhuis), the Netherlands. This study was conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act, and was approved by the local Medical Ethical Review Board (METC Brabant). Data for this paper were obtained between November 2016 and September 2018.

Participants

Patients were consecutively included at first consultation between November 2016 and August 2018. Inclusion criteria were symptoms of osteoarthritis leading to limitations in activities of daily living. Patients were excluded from the study when having insufficient knowledge of the Dutch language or when suffering from a neurological condition (e.g., dementia) preventing them from understanding or

completing the questionnaires. Patients who received no diagnosis of osteoarthritis and were planned for treatment other than surgical treatment (i.e., other than joint replacement) were excluded from analyses.

Procedure

The general practitioner referred patients to the Department of Orthopedics. At least 48 hours before consultation, eligible patients were contacted by phone for permission to send an information package. All included patients gave written informed consent and received a questionnaire one week after their medical consultation.

Measures

Demographic and clinical data were collected.

Expectations

The Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES) [126] and the Hospital for Special Surgery Knee Replacement Expectations Survey (HSS-KRES) [86] were developed by Mancuso et al. to assess pre-operative expectations. Hip and knee patients were asked how much improvement they expected in 18 or 19 domains, respectively. Answers could range from 1 (*I do not have this expectation*) to 5 (*complete improvement or back to normal*) or (0) "this question does not apply". The total score could range from 0 to respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value represents the combined amount of expectations the patient has and the level of these expectations. For example, a patient with a score of 100% indicated that (s)he expected maximum improvement, in all domains. The Dutch version of this questionnaire showed good test-retest reliability and good internal consistency [127].

Functional status

The Hip injury and Osteoarthritis Outcome Score (HOOS) [128] or the Knee injury and Osteoarthritis Outcome Score (KOOS) [129] were used to assess pain, other symptoms of osteoarthritis, and functional status. The questionnaires consist of respectively 42 and 40 items, which could be divided into the following 5 subscales: pain, other symptoms, functioning in daily living, functioning in sports and recreation, and hip- or knee related quality of life [128,129]. The latter subscale was not used in the analyses. Participants had to indicate on a 5-point Likert-scale whether they experienced the problems presented during the last week. Total scores were derived by summing the answers of each scale and dividing them by 4. Scores could range from respectively 0 to 100, with lower scores indicating more extreme problems [128-130]. The scales have good psychometric properties [128,129,131].

Statistical analysis

Statistical analysis were performed using IBM SPSS Statistics version 24 and LatentGold Choice version 5.0 [132,133]. A 0.05 level of significance was applied to evaluate statistical significance. Bonferroni or Bonferroni-Holm corrections were used to adjust for multiple comparisons in several analyses.

A number of independent samples t-tests and chi-square tests for independence were conducted to examine differences between hip and knee patients on demographics (e.g., age, sex), expectations and predictor variables (e.g., pain, function). Average values of expectations and predictor variables were compared to base rates. A Bonferroni adjusted significance level of 0.002 was used.

Factors associated with general expectations

To identify factors associated with general expectations (first aim), a linear regression analysis was performed for hip and knee patients separately, regressing general expectations on sociodemographic (age, sex, education) and clinical (pain, other symptoms and functioning) variables.

Identifying subgroups of patients based on individual differences in types of expectations

Our second aim was to identify and examine different subgroups of patients. In order to reduce the number of estimated parameters in the LCA, the items of the HSS-HRES and HSS-KRES were first reduced into different expectation domains using Principal Component Analysis (PCA; oblimin rotation). Missing values were excluded listwise. The number of factors was identified based on the Kaiser criterion (select factors with eigenvalues ≥ 1) and Horn's parallel analysis [134,135]. The reliability of the factors was estimated with Cronbach's alpha coefficient. A value ≥ 0.7 was considered acceptable [136].

In LatentGold [132,133], a LCA was conducted using the continuous factors extracted during the PCA as indicators, to identify a number of distinct subgroups each representing a different pattern of expectations. Model fit of models from 0 up to 10 subgroups was examined using the Bayesian information criteria (BIC). As lower BIC values indicate better fit of a model relative to another model, the model with the lowest BIC was selected.

Characterization of subgroups

Our third aim was reached by applying the Step3 method [132], which conducts a series of univariate regression analyses to compare the different subgroups on sociodemographic (age, sex, education) and clinical (pain, other symptoms, function) characteristics. All predictors were entered as continuous dependent variables with a BCH adjustment and proportional classification, except for sex and education. A Bonferroni-Holm correction was applied to correct for multiple testing.

RESULTS

Patient characteristics

A total of 832 patients were included in the study. Of these patients, 528 (63%) returned their questionnaires. A subset of these patients, that is, patients scheduled for joint replacement (N = 287) were included in this paper. This is an acceptable sample size for LCA [137,138]. Table 1 shows the sociodemographic and clinical characteristics of the participants. General expectations were higher for hip patients than for knee patients. The three most important expectations were walking ability, daily pain relief, and ability to put on socks and shoes, for hip patients (Figure 1a), and moderate walking distance, pain relief and squatting for knee patients (Figure 1b).

Compared to the general population, patients with osteoarthritis indicated more pain, more osteoarthritis related symptoms, and less function. In addition, knee patients generally had more symptomatic osteoarthritis and less function in daily living than hip patients post-consultation.

Table 1. *Characteristics and expectations of hip and knee patients*

	Norms	Hip and knee combined (N = 287)	Hip (N = 131)	Knee (N = 156)	Hip vs. knee	
					t / χ2	*p*
Women – N (%)		163 (57)	70 (53)	93 (60)	1.1	.29
Age - mean (SD)		70 (8)	71 (8)	69 (7)	1.9	.06
Education – N (%)					1.2	.54
Primary education		46 (17)	24 (19)	22 (15)		
Secondary education		182 (65)	82 (65)	100 (66)		
Tertiary education		51 (18)	21 (17)	30 (20)		
Expectations % (SD)		69.6 (19)	73.2 (20)	66.6 (18)	3.0	≤.01
HOOS/KOOS						
Pain	78.6-87.7[54,a]	40.2 (18.6)	39.2 (19.8)	41.0 (17.6)	-0.8	.42
Symptoms	77.1-88.4[54,a]	43.1 (18.5)	38.3 (20.3)	47.1 (15.8)	-4.1	≤.001
Function in daily living	77.4-86.3[54,a]	43.5 (19.8)	40.4 (19.4)	46.0 (19.9)	-2.4	.02
Function in sports and recreation	61.0-72.6[54,a]	20.4 (22.8)	22.4 (23.3)	18.6 (22.3)	1.4	.17

Notes: For continuous characteristics, independent samples t-tests were conducted between hip and knee patients. For nominal characteristics, chi-square tests were conducted between hip and knee patients. a = Scores for KOOS for women and men in the age from 55-74 years old from a general population

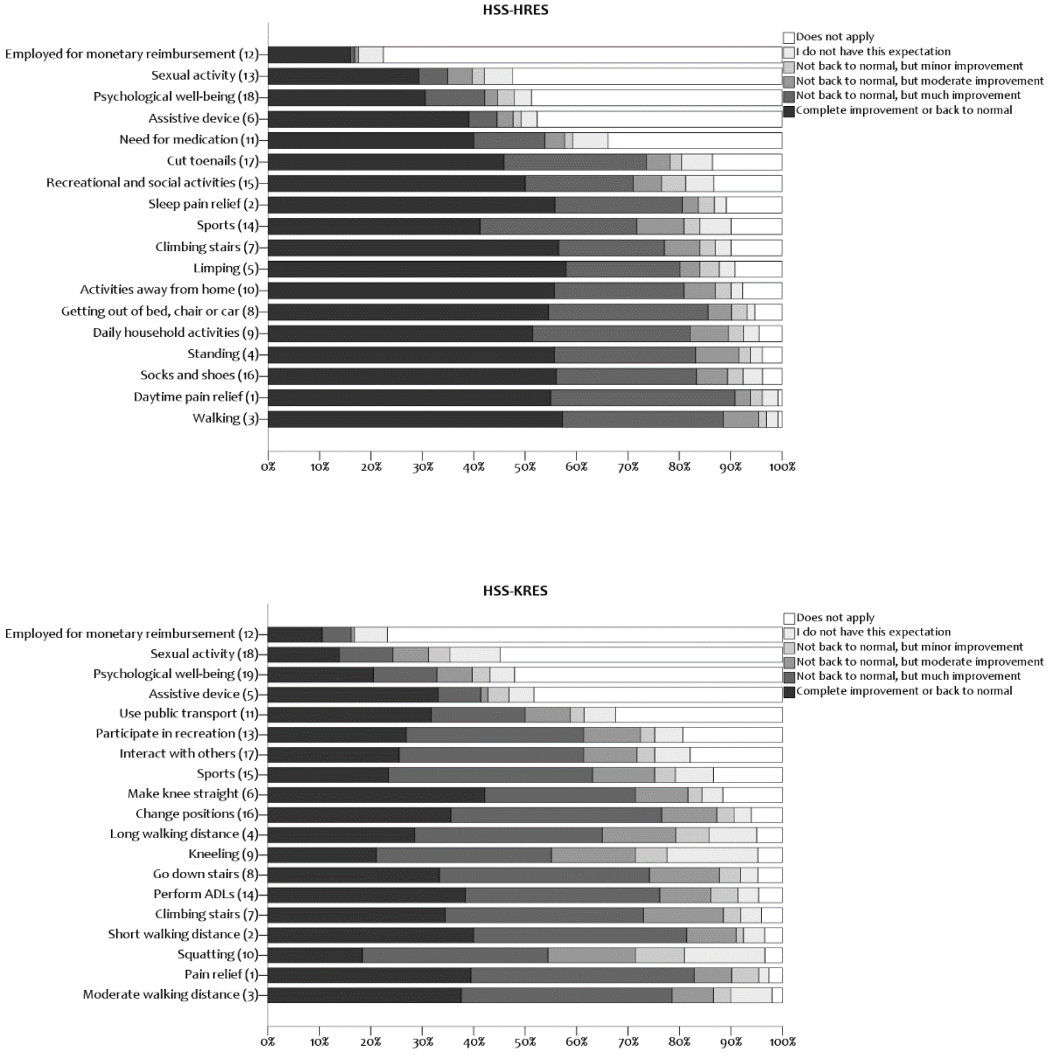

Figure 1a-b. *Percentages of patients' responses on items of HSS-HRES (a) and HSS-KRES (b).*

Patients' expectations of improvement as a result of surgery are shown as responses on the respectively 18 or 19 domains of the HSS-HRES (a) and HSS-KRES (b). The items are displayed on the rows, with the distribution of answers of patients among the 5 possible answer categories presented on each bar.

Factors associated with general expectations

Younger age was related to higher expectations in hip patients (t = -2.2, p = .03), but not in knee patients (t = 0.5, p = .70). Moreover, being male was significantly related to higher expectations in knee patients (t = 2.1, p = .04), but not in hip patients (t = 1.0, p = .32). In addition, an association existed between expectations and function in sports and recreation in knee patients (t = -2.0, p = .04), yet not in hip patients (t = -0.5, p = .63). In knee patients, the higher the disability in sports and recreation, the higher, and more important, the scores on expectations. Education, pain, symptoms, and function in daily living were not associated with general patient expectations.

Identifying subgroups of patients based on individual differences in types of expectations

Table 2 shows the results of the EFAs for the HSS-HRES and HSS-KRES. A three-factor structure and a four-factor structure showed the best fit to the data for respectively hip and knee patients according to both the Kaiser criterion and Horn's parallel analysis [134], explaining 63% (HSS-HRES) and 66% (HSS-KRES) of the total variance in item scores. Factor 2 of the HSS-HRES and factor 3 of the HSS-KRES initially showed insufficient internal consistency. Removing item 15 (i.e., 'Sports') and 12 (i.e., 'Employed for monetary reimbursement') of the HSS-KRES, and forcing a two-factor structure on the HSS-HRES improved internal consistency (Table 2) and resulted in a two-factor structure for knee patients and a four-factor structure for hip patients.

For hip patients, the first factor consisted of activities related to everyday living (ADL) (e.g., 'getting out of bed, chair or car') and Quality of Life (QoL) ('recreational and social activities'). This factor was termed 'expectations for improvement in ADL and QoL'. The second factor consisted of expectations for improvement in psychosocial domains (e.g., 'psychological well-being') and expectations for the ability to be independent of tools (i.e., assistive devices). This factor was termed 'expectations for psychosocial improvement and independence'.

For knee patients, the first factor consisted of expectations regarding movement (e.g., walking distance) and pain relief. This factor was termed 'expectations for pain relief and ability to move'. The second factor contained items related to psychosocial well-being (e.g., 'psychological well-being') and was termed 'expectations for psychosocial improvement'. The third factor contained two items related to independency (e.g., 'use public transportations') and was termed 'expectations for an independent lifestyle'. The final factor contained items related to ADL (e.g., 'perform ADLs'). It was therefore termed 'expectations for improvement in ADL'.

Table 2. *Exploratory factor analysis on HSS-HRES and HSS-KRES*

	Component - factor loadings				**Cronbach's alpha**
HSS-HRES - Item (#)	ADL / QoL	Independence / Psychosocial			
Activities away from home (10)	.95				.95
Getting out of bed, chair or car (8)	.94				
Daily household activities (9)	.94				
Walking (3)	.93				
Daytime pain relief (1)	.88				
Socks and shoes (16)	.86				
Climbing stairs (7)	.77				
Limping (5)	.74				
Standing (4)	.73				
Sports (14)	.63				
Recreational and social activities (15)	.63				
Cut toenails (17)	.61				
Sleep pain relief (2)	.58				
Psychological well-being (18)		.78			.71
Sexual activity (13)		.72			
Employed for monetary reimbursement (12)		.65			
Assistive device (6)		.55			
Need for medication (11)		.50			
HSS-KRES - Item (#)	Pain / Movement	Psychosocial	Independence	ADL	
Moderate walking distance (3)	.99				.91
Long walking distance (4)	.91				
Short walking distance (2)	.90				
Pain relief (1)	.75				
Psychological well-being (19)		.86			.74
Sexual activity (18)		.76			
Interact with others (17)		.53			
Participate in recreation (13)		.48			
Use public transport (11)			.85		.69
Assistive device (5)			.77		
Make knee straight (6)			.50		
Kneeling (9)				-.94	.92
Squatting (10)				-.85	
Go down stairs (8)				-.49	
Climbing stairs (7)				-.49	
Change positions (16)				-.37	
Perform ADLs (14)				-.36	

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

Item numbers in parentheses are the numbers within the Dutch version of the HSS-H/KRES. HSS-H/KRES = Hospital for Special Surgery Hip/Knee Replacement Expectations Survey. ADL = Activities of daily living, QoL = Quality of life

LCA analyses were conducted separately for knee and hip patients to identify a distinct number of latent subgroups representing different expectation patterns. The BIC suggested a three-subgroup model for both hip and knee patients (Table 3).). For hip patients, subgroup 1 is characterized by high expectations (Table 4). Patients in subgroup 2 had the same pattern of expectations. However, they had lower expectations. Patients in subgroup 3 had the same pattern as 1 and 2, but prioritized their expectations the lowest (Table 4). In knee patients, subgroup 1 was characterized by relatively high expectations, except for expectations for improvement in ADL. Subgroup 2 had relatively moderate expectations in all domains. Patients in subgroup 3 had relatively low expectations, and regarded expectations for improvement in performance of ADL as most important (Table 4).

Table 3. *Indicators of fit for one to five clusters for HSS-HRES and HSS-KRES*

HSS-HRES	LL	BIC (LL)	Npar
1-Class	-328.2	675.4	4
2-Class	-276.9	596.5	9
3-Class	**-259.0**	**584.5**	**14**
4-Class	-251.3	592.8	19
5-Class	-245.1	604.2	24
HSS-KRES			
1-Class	-690.4	1419.3	8
2-Class	-625.6	1332.9	17
3-Class	**-592.2**	**1309.3**	**26**
4-Class	-575.5	1319.1	35
5-Class	-565.5	1342.4	44

Notes:

HSS-HRES = Hospital for Special Surgery Hip Replacement Expectations Survey

HSS-KRES = Hospital for Special Surgery Knee Replacement Expectations Survey

Table 4. *Subgroup response means of expectation domains, sociodemographic, clinical and psychosocial factors*

	Hip patients				Knee patients			
	Group 1	Group 2	Group 3	*p*	Group 1	Group 2	Group 3	*p*
Class size	46%	37%	18%		62%	30%	8%	
Expectation domain scores[a]								
ADL / QoL	0.72	-0.16	-1.56					
Independence / Psychosocial	0.52	-0.24	-0.84					
Pain / Movement					0.51	-0.56	-2.10	
Psychosocial					0.29	-0.25	-1.46	
Independence					0.21	-0.08	-1.48	
ADL					-0.45	0.48	1.90	
Demographics								
Women	39%	62%	53%	.18	51%	68%	56%	.45
Age	68.5	71.3	73.1	.07	67.5	69.8	62.9	.02
Education				.32				.16
Primary education	15%	22%	27%		10%	11%	3%	
Secondary education	61%	61%	58%		69%	69%	52%	
Tertiary education	22%	15%	11%		20%	20%	46%	
HOOS/KOOS								
Pain	34.0	38.5	47.5	.13	35.8	47.0	54.8	.004*
Symptoms	32.6	35.7	54.9	.02	42.3	54.6	51.1	.006*
Function in daily living	33.5	40.9	54.7	.007*	41.7	47.6	61.1	.06
Function in sports and recreation	15.2	21.2	43.2	.005*	11.5	20.0	36.3	.02

Notes: a = These values are displayed in the 'profile' table in LatentGold. The expectation domain scores are mean centered: subgroup response means above (or below) zero indicate larger (or smaller) than average domain scores in a particular subgroup. ADL = Activities of daily living, QoL = Quality of life

* Bonferroni-Holm corrected $p \leq .05$. All p-values result from an omnibus Wald test, assessing the association between class membership and individual predictor variable

Characterization of subgroups

After a Bonferroni-Holm correction, only function in ADL, sports, and recreation showed a significant relationship with differences in subgroups in hip patients (Table 4; Figure 2a). Pain and other symptoms were associated with differences in subgroups in knee patients (Table 4; Figure 2b).

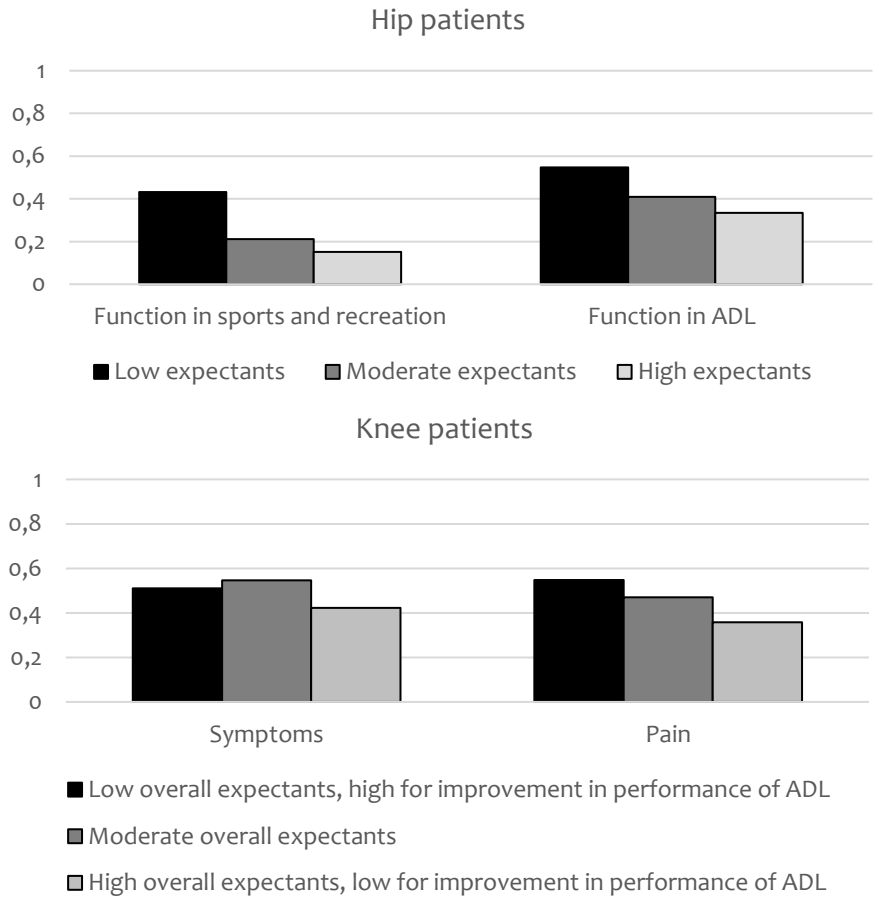

Figure 2a-b. *Latent class profile plot showing significant associates of HSS-HRES (a) and HSS-KRES (b).*

Each line represents a class of patients. Names of lines are derived from the general pattern of expectations with regard to the different domains.

Hip patients with overall low expectations had less problems in functioning than patients with moderate expectations, and even less than patients with overall high expectations. In knee patients, the patients with the lowest overall expectations, but with the highest expectations for improvement in ADL, had the least pain. Patients with moderate expectations had somewhat higher levels of pain. Patients with the highest expectations overall, but the lowest expectations for improvement in ADL, had the most pain. Patients with high expectations reported having symptoms like stiffness and limited range of motion most often. Patients with low expectations reported somewhat less symptoms, and patients with moderate expectations had the lowest probability of reporting symptoms.

DISCUSSION

This study aimed to (1) identify factors associated with patient expectations and to (2) identify and (3) characterize different subgroups of patients based on individual differences in types of expectations. Both hip and knee patients could be classified into three subgroups. In this study, sociodemographic factors were associated with general expectations, but not with the expectation domains. However, pain, symptoms like stiffness and limited range of motion, and function were the most important associates of differences in subgroups.

When examining general expectations, knee patients low in function in sports and recreation reported the highest level of expectations. Knee patients, in general, experienced less symptoms like stiffness and limited range of motion and better function in daily living than hip patients. It might be that they shift the boundaries of their wishes and expectations to domains in which functioning is worse, so that if their problems with sports and recreation are bigger than problems with daily living, they might be prone to attend to these more minor or advanced problems [85-87,95,100,139]. This could result in overall high expectations, as the expectation score is the sum of all items.

Nevertheless, expectations should be seen as a multidimensional construct, involving three or four distinct domains. Internal consistency was insufficient for the 'psychosocial factors and independence' domains, in both hip and knee patients, which could be explained by low applicability/rating of certain items loading on this factor. For example, patients generally were retired, and therefore did not expect benefits for employment. Simultaneously, this could be an argument for why these items were grouped together in one expectation domain, and possibly accounts for the domain's low internal consistency [140].

Our findings denote that the different expectation subgroups were characterized by clinical factors. Hip patients who had the highest expectations in all domains, compared to other hip patient subgroups, had the highest probability of experiencing disability in function in ADL, as well as in recreation and sports, which is in accordance with the literature [81,85-87,90,92,95,97,139]. For knee patients the identified expectation subgroups did not differ in function. Pain and other symptoms, in our sample, more prominently differed between knee patient subgroups than function. Patients with high overall expectations have the highest probability of experiencing pain and vice versa. Knee patients with moderate expectations had the least likelihood of experiencing symptoms like stiffness and limited range of motion. No other known study examined the influence of symptoms other than pain on the level of expectations. Nonetheless, it would be expected, based on previous findings regarding pain or function [81,85-87,90,92,95,97,139] that the less symptoms, the lower the expectations. Yet, there might be no linear relationship between symptoms like stiffness and limited range of motion, and expectations. Future research should further examine the relationship between symptoms other than pain and expectations in relationship with the influence of function on expectations.

Some studies found a relationship between sex and age and *general expectations* [68,84,85,87,89-91,93-95,97,125], while others did not [80,89,94,97,101,125]. Our study did confirm that subgroups of patients were not characterized by either sex or age. It seems that these sociodemographic factors are only (inconsistently) associated with expectations

when examining the overall construct of expectations and not when examining domains of expectations. This might indicate that these factors are merely confounding factors and no genuine associates. Perhaps, sociodemographic factors are related to differences in clinical factors and only therefore to general expectations. For example, younger patients might experience more limitations in daily living than older patients might and could therefore report higher levels of expectations.

This study has some limitations. Firstly, we do know that patients high in pain and disability generally report higher expectations. However, we merely examined high expectations and were not able to differentiate between realistic and unrealistic expectations. Future research should verify whether different subgroups are associated with having unrealistic expectations. Secondly, we were unable to retract data from patients who refused participation in the study. Therefore, potential selection bias could not be addressed. However, this study has some important clinical implications. Physicians should be made aware of the fact that most patients have high expectations, relating to the presence of pain, other symptoms, and physical dysfunction. Emphasis should be placed on patients high in dysfunction and pain, as it has been found that these patients might have unrealistic expectations of surgery outcomes [51,75-78]. Moreover, patients low in dysfunction and pain should not be neglected, as low expectations could be associated with less (motivation to obtain) results in rehabilitation [72,73]. Expectations have to be discussed during medical consultations in order to assure that patients develop realistic expectations [32,55,102]. Knee patients in particular should be educated about the expected effects of surgical treatment, in order to prevent low improvement rates [23,29-33,58].

To conclude, sociodemographic factors were associated with general expectations, but not with the expectation domains. Nevertheless, the three identified subgroups differed most prominently on pain, other symptoms, and physical dysfunction, related to higher, possibly unrealistic expectations in both hip and knee patients.

CHAPTER 3

THE DISCUSSION OF SURGICAL OUTCOMES IN AN ORTHOPEDIC SETTING: EXAMINING THE RELATIONSHIP BETWEEN WORD USE AND WRITTEN OUTCOME EXPECTATIONS

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ABSTRACT

Introduction – More than one-fourth of hip and knee patients describe some degree of dissatisfaction after hip or knee replacement surgery. Dissatisfaction might be related to unfulfilled expectations. Patients' expectations for outcome of treatment are thought to be formed through interaction with the physician. However, it seems that expectations are rarely explicitly discussed during a medical consultation. This study aimed to examine whether (expectations for) outcomes of treatment are discussed with orthopedic hip and knee patients within a pre-treatment medical consultation. Moreover, it examined and compared word use of these patients and their physicians during the discussion of potential outcomes of treatment. Additionally, the relationship between word use and change in patients' expectations from pre-consultation to post-consultation was analyzed.

Methods – Thirty-one patients visiting an orthopedic surgeon completed questionnaires pre- and post-consultation assessing expectations of treatment outcomes. Their medical consultation was audio recorded and analyzed with Linguistic Inquiry Word Count (LIWC) software.

Results – On average, 49 seconds (SD = 45.6) (i.e., 5.5% of the total duration of the consultation) were spend on the discussion of (expectations for) potential outcomes of treatment. Patients and physicians differed in word use within these fragments. Concerns and needs were mostly non-discussed, despite the fact that patients have high expectations. Change in expectations was related to more use of present tense by patients and less use of third person singular pronouns by physicians.

Conclusion – Potential outcomes of surgery were only briefly discussed during consultation. The difference in word use between patients and physicians suggest a gap in communication, in which content wise patients may fail to disclose their expectations. However, word use was related to a change in expectations and the importance of doctor-patient communication should therefore be taken into account in clinical practice.

INTRODUCTION

More than one-fourth of hip and knee patients describe some degree of dissatisfaction after what clinically seems a successful orthopedic surgical treatment option [19,38,52,55-57]. Even though dissatisfaction rates differ between hip and knee patients, dissatisfaction in both patient groups might be related to unfulfilled expectations [19,31,38,52,55-57,77,78,82,83,101,119-122]. Unfortunately, up to half of the patients have too optimistic expectations of treatment outcomes [51,75-78].

Approximately 40% of these orthopedic patients' expectations are thought to be formed through interaction with the physician [101,103,104]. Nevertheless, it is found that only 10% of patients tend to discuss all the subjects they would have liked to mention during medical consultation [141]. Most patients neglect to ask for information, clarification, or explanation [99,101,107-110,142-145]. Physicians generally pay little attention to the perceptions of patients [107,108], while patients do not disclose their expectations partly due to false beliefs about the purpose of the medical consultation [107-110]. It therefore seems that expectations are rarely explicitly discussed during a medical consultation [99,107-110,143].

If expectations are formed within medical consultation, yet not being explicitly discussed, it might be that another aspect of the doctor-patient communication, such as word use is of influence on the formation of expectations. So far, only one study has examined word use as a predictor for outcome [146] and none has focused on how it might be associated with outcome expectations. An in-depth examination of communication suggests that the use of different pronouns and tenses could guide the agenda and tone of a conversation [147,148] and could shape outcomes after medical consultation [146,149,150]. For example, the use of plural first person pronouns (e.g., 'we' and 'us') indicates cohesion and a sense of collaboration that could possibly direct both conversation partners to the exploration of the patient perspective [146-149]. In addition, the use of future tense is possibly related to the amount and level of pre-consultation expectations, as it demonstrates a treatment and expectation oriented conversation, which could broaden the discussed topics [150].

Furthermore, if patients' expectations are, at least partly, a result of the interaction with the physician, the amount and complexity of information the physician provides could affect expectations post-consultation. The amount of information provided seems to be partially determined by the patients' communication style. Patients who have high pre-consultation expectations and express their needs and concerns during consultation will receive more information from physicians [151-153]. However, the physicians' communication style might also determine the provided information within a consultation. It was found that when physicians use more words that express certainty (e.g., absolute, clear, and definite) this might lead to premature closure of the consultation, risking not knowing what patients expect [154].

During the course of a conversation, both parties tend to match their language style to one another [155]. This leads to a better social relationship and a sense of connectedness [156,157]. Nonetheless, it could also lead to misunderstanding. The more complex the word use of patients, the more physicians seem inclined to use technical jargon, thereby often overestimating what patients know about the disease or treatment [151-153]. It has been presumed that when a word is being introduced, both speakers understand the meaning of that word [152]. Notwithstanding that patients might mean something different with their words than physicians do [158], perhaps leading to misunderstanding about what to expect.

In addition, the valence of words of both patients and physicians could also be associated with outcome expectations post-consultation. Physicians who use more positive words are rated as more trustworthy and patients are more content with those physicians than with physicians who use more negative words [146,159]. It has been suggested that positive words therefore lead to a better understanding and better recall of the given information [159], which could help form patients' expectations.

Expectations about outcomes of treatment have to be discussed during medical consultations in order to assure that patients develop realistic expectations [52,55,102]. Moreover, numerous studies found that effective communication predicts more

mutual understanding, more satisfaction with the medical consultation, and general beneficial mental and physical health outcomes (e.g., [99,160,161]), while ineffective communication could lead to more distress, unnecessary prescriptions and treatment, and lower quality of life [162-165]. Nevertheless, no known study actually examined whether treatment outcomes or expectations for treatment outcomes are explicitly discussed within medical consultation and whether certain linguistic aspects of the doctor-patient communication are related to patients' outcome expectations. This study therefore aims to 1) examine whether (expectations for) outcomes of treatment are currently being discussed within a pre-treatment medical consultation with orthopedic hip and knee patients scheduled for surgery. Moreover, it 2) examines and compares word use of patients and physicians within the discussion of (expectations for) outcomes of treatment. Additionally, 3) the relationship between word use and change in patients' expectations from pre-consultation to post-consultation will be analyzed. Comparisons will be made between hip and knee patients, as dissatisfaction rates are higher and outcomes prove generally worse for knee patients as compared to hip patients [19,23,29-33,38,52,55-58].

METHODS

Data for this paper were collected between April 2017 and October 2017 as part of the EXPECT-study, a prospective cohort study examining expectations and satisfaction in hip and knee osteoarthritis patients. This study was conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act, and was approved by the local Medical Ethical Review Board.

Participants

Patients were consecutively included at first consultation. Patients were excluded from the study when they were unable to understand or complete the questionnaires (e.g., if having insufficient knowledge of the Dutch language or suffering from severe cognitive impairment (e.g., dementia)). In this paper, a subset of patients was used,

namely, only patients who were scheduled for hip or knee arthroplasty after the consultation.

Procedure

Patients were referred by a general practitioner and identified as eligible for study participation at least 48 hours before consultation. Patients willing to participate were asked to complete the informed consent form and first questionnaire (T0) before onset of the appointment. Patients were then asked to take place in an, for this study, equipped consultation room. The recording device, desks, and chairs were placed in a particular and consistent manner (See Figure 1). The recording of the consultation started when patient and orthopedic surgeon were seated in the consultation room. Recording was done by means of two cameras (Logitech QUICKCAM® PRO 9000) standing in the middle of the desk, directed towards the physician and the patient. The built-in microphones were used for audio recording. For the purpose of this paper, only audio recordings of patients and physicians were used in this paper. All included patients received a second questionnaire one week post-consultation (T1).

Figure 1. *Arrangement of consultation room for video and audio recording*

Measures

Patients completed the Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES) [126] or the Hospital for Special Surgery Knee Replacement Expectations Survey (HSS-KRES) [86] at T0 and T1. Patients were asked to indicate their expectations for outcomes of treatment following the consultation. They were asked how much improvement they expected in respectively 18 or 19 questions. Answers could range from 0 (*this question does not apply*) and 1 (*I do not have this expectation*) to 5 (*complete improvement or back to normal*). The total score could range from 0 to

respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value represents the combined amount of expectations the patient has and the level of these expectations. For example, a patient with a score of 100% indicated that (s)he expected maximum improvement, in all domains. The Dutch version of this questionnaire was validated by van den Akker-Scheek et al. [127] and has good psychometric properties.

Analyses

All recorded medical consultations were transcribed verbatim. Thereafter, only the fragments that concerned a discussion of (expected) outcomes of the prescribed treatment were selected. Box 1 displays arguments for selection of fragments and several examples of selected fragments. Areas that were indicated by the HSS-HRES and HSS-KRES as possible domains for expectations were used as guidance for the selection of fragment. Consequently, the discussion of (the risk for) possible complications during surgery or directly after surgery were not selected, because they do not concern expected outcomes resulting from joint replacement, but merely consequences from performing surgery in general. In contrast, (expectations for) pain improvement and the ability to be employed or to engage in social activities were selected. Both fragments with explicit and implicit expectations for outcome of treatment were selected (for examples, see Box 1).

Box 1.

Criteria for selection	Definition	Example [a]
Explicit expectation for outcome of treatment	An explicit statement regarding the "belief that treatment will achieve particular outcomes" [63]. NOT: complications during surgery	Patient: "*If it will resolve my pain and it will be all right*." Physician: "*10 percent of patients remain to be in unexplained pain after surgery*"
Implicit expectation for outcome of treatment	An implicit reference towards a "belief that treatment will achieve particular outcomes" [63]. NOT: complications during surgery	Patient: "*We would like to continue doing all sort of things and we are currently hindered in these things, even though it could be resolved*" Physician: "*A knee prosthesis is a good solution when the pain that is troubling you determines your life entirely*"

Notes:

a = examples are translated from the original Dutch language to English language.

Transcripts were split based on speaker and utterances produced by anyone other than the physician or the patient (e.g., partner of the patient) were removed. Analyses were performed using IBM SPSS Statistics version 24. Data from included patients were compared with data from patients who gave no consent to tape their medical consultation and to patients who were not taped due to unforeseen practicalities regarding overlapping appointments and technical difficulties. A 0.05 level of significance was applied to evaluate statistical significance.

Discussion of (expectations for) outcomes of treatment

To examine the first aim of this paper, the time used for discussion of (expectations for) outcomes of treatment per consultation was divided by the total time of the medical consultation. This new variable presents a percentage of time per consultation that was devoted to the discussion of (expectations for) outcomes of treatment. Several independent samples T-tests were conducted to examine differences between hip and knee patients.

Word use in patients and physician

The reliable and validated Linguistic Inquiry and Word Count (LIWC) software program [166,167] was used to categorize words from the 31 transcripts into different groups. It calculates total word count, mean words per sentence, and distinguishes between 68 different linguistic categories. Results are presented as percentages of the total word count used in each specific category. This study focuses on the categories 'pronouns', 'tense', 'positive emotions', 'negative emotions', and 'certainty'. The two categories 'needs' (e.g., wanting, needing, desire, wish, hope) and 'jargon' (e.g., coxarthrosis, femur, osteophytes) were added to the LIWC dictionary in light of the purpose of the current study. Base rates were collected from a study that summarized 2014 spoken language files [166]. These base rates represent mean percentages found within different word categories in these language files.

For the second aim of this paper, several paired samples T-tests were done to examine differences on the different categories of words between hip patients and knee patients and their physicians during the selected fragments. In order to assess the similarities in word use within categories, multiple Pearson product-moment correlations were performed. R-values between (-) 0.3 and (-) 0.49 indicated a weak relationship, and values between respectively (-) 0.5 and (-) 0.7, and (-) 0.7 and (-) 1 indicated a moderate or strong relationship [168].

Relationship between word use and change in expectations

A measure of change in expectations over time (i.e., from T0 to T1) was computed by subtracting the patients' T1 expectation score from the patients' T0 expectation score. The resulting score could range from -1 to 1, with positive values indicating an increase in expectations and negative values indicating a decrease in expectations.

Multiple bivariate Pearson product-moment correlations were conducted to examine the relationship between change in expectations and time spend discussing (expectations for) outcomes of treatment and the categories of word use (i.e.,

'pronouns', 'tense', 'positive emotions', 'negative emotions', 'certainty', 'needs' and 'jargon') during the discussion of (expectations for) outcomes.

RESULTS

Of the 222 included patients in the questionnaire part of the EXPECT-study, 194 patients gave additional consent to record their medical consultation (78%). Of these 194 patients, 116 patients (60%) were actually taped during consultation. The other 78 patients were not taped due to unforeseen practicalities regarding overlapping appointments, and technical difficulties. Recordings of a subset of these patients, namely patients who were scheduled or planned for surgery after consultation, were transcribed verbatim. This resulted in 31 transcriptions.

Thus, 31 patients (68.9 ± 7.5 years of age) were included in the study of which 51.6% was female (n = 16) and 54.8% hip patients (n = 17) (Table 1). No significant differences were found between included patients and patients who either did not consent to record their consultation or patients who gave written consent, but were not recorded due to unforeseen practicalities in terms of age (respectively: t = 0.3, p = .80 and t = -1.0, p = .34), sex (χ^2 = 1.2, p = .55) and being a hip or knee patient (χ^2 = 1.9, p = .39).

On a scale of 0% to 100%, patients on average had a score of 70.3% ± 22.8 as expectation score for outcomes of surgery pre-consultation and a score of 71.8% ± 17.8 post-consultation (Table 1). No significant differences were found between hip and knee patients in terms of expectations score (Table 1).

Table 1. *Baseline characteristics*

Mean (SD)	Included in paper (N = 31)	Hip patient (N = 17)	Knee patient (N = 14)	t / χ^2	*P*
Age	68.9 (7.5)	69.5 (9.4)	69.5 (9.4)	0.3	.77
Women – N (%)	16 (52)	11 (65)	5 (36)	2.6	.11
Time discussing (expectations for) outcomes of surgery [a]	49.1 (45.6)	57.3 (56.0)	39.1 (27.4)	1.1	.28
Total duration of consultation [b]	15.5 (5.6)	17.3 (3.6)	13.3 (6.7)	2.1	≤.05
Percentage of consultation discussing (expectations for) outcomes of surgery	5.5 (4.9)	5.8 (6.1)	5.1 (3.2)	0.4	.72
Expectations					
To	70.3 (22.8)	73.5 (23.6)	65.4 (21.7)	0.9	.37
T1	71.8 (17.4)	70.4 (19.2)	73.6 (15.3)	-0.4	.66
Change in expectations	-1.2 (15.1)	-3.8 (13.5)	3.7 (17.5)	-1.1	.26

Notes: a = in seconds. b = in minutes. To = pre-consultation. T1 = post-consultation

Discussion of (expectations for) outcomes of treatment

On average, the duration of the medical consultation was significantly longer in hip patients (17.3 minutes) as compared to knee patients (13.3 minutes) (Table 1). Less than one minute of the medical consultation (i.e., 49 seconds on average) was used to discuss (expectations for) outcomes of surgery (SD = 45.6). This number corresponds with 5.5% of the entire duration of the consultation. No significant differences were found between hip patients and knee patients in terms of absolute time discussing (expectations for) outcomes of surgery and percentage of time, as compared to the total duration of the medical consultation.

Word use in patients and physician

Word use of patients and physicians are presented in Table 2. Significant correlations were found between word count of patients and word count of physicians (r = .39, *p* = .03), the use of singular (r = .41, *p* = .04) and plural first person pronouns in patients and physicians (r = .41, *p* = .04), and the use of anxiety words in patients and physicians (r = .58, *p* = .002). Hip patients used significantly more second person pronouns than knee patients (t = 2.8, *p* = .01). Moreover, physicians of hip patients used less affective wording (t = -2.2, *p* = .04), especially regarding negative emotions (t = -3.8, *p* = .001) as sadness, than physicians of knee patients (t = -3.2, *p* = .004).

Overall, physicians tended to use more words and more words per sentence than patients did. First person singulars (e.g., I, me, mine) were more used by patients, whereas first person plurals (e.g., we, us, our) and second person words (e.g., you, your) were more adopted by physicians. Moreover, physicians used more present focus in their wording than patients. Furthermore, patients are more 'certain' than physicians in their talk, that is, they used significantly more words that expressed certainty (e.g., absolute, evident). Concerns and needs are mostly non-discussed.

Table 2. *Word use in different linguistic categories*

	Base rates [166]	Mean patients	Mean physicians	Paired T-tests patients vs. physicians		Correlations patients vs. physicians	
				T	*p*	*r*	*p*
Word count	N/A	36.5	124.7	-4.2	.001	.39	.03
Words per sentence	25.9	6.7	13.3	-3.9	.001	-.05	.82
Dictionary words	91.5	96.3	94.9	1.4	.19	.25	.22
1st person singular	6.3	8.0	2.0	5.5	.001	.41	.04
1st person plural	1.1	0.2	1.8	-4.4	.001	.41	.04
2nd person	3.9	0.8[a]*	5.1	-5.4	.001	.19	.37
3rd person singular	1.5	0.1	0.1	-0.6	.53	-.00	.99
3rd person plural	0.8	0.1	0.1	-0.3	.74	-.10	.63
Impersonal pronouns	7.9	7.1	8.2	-1.1	.30	.21	.31
Past focus	4.0	0.9	0.4	1.0	.31	-.02	.92
Present focus	14.0	9.1	12.5	-2.4	.02	-.21	.31
Future focus	1.0	0.5	1.2	-2.0	.06	-.04	.85
Affective processes	4.9	5.3	6.3[b]*	-0.8	.43	.03	.87
Positive emotion	3.4	4.0	4.7	-0.8	.42	.16	.42
Negative emotion	1.5	1.3	1.6[b]**	0.0	.98	.15	.45
Anxiety	0.2	0.0	0.0	-0.4	.68	.58	.002
Anger	0.6	0.0	0.0	-1.7	.11	N/A	N/A
Sadness	0.2	1.2	1.6[b]**	-0.2	.86	-.01	.96
Certainty	1.3	22.3	5.9	3.2	.004	-.09	.67
Needs	N/A	1.7	1.1	0.7	.51	-.11	.59
Jargon	N/A	0.3	0.3	-0.2	.83	.10	.63

Notes: all values are percentages of total word count used in that category, except word count and words per sentence. Base rates are obtained from a study that summarized 2014 spoken language files.

a = hip patient higher than knee patient

b = knee patient higher than hip patient

* $p \leq .05$, ** $p \leq .01$

Relationship between word use and change in expectations

A significant positive correlation was found between the use of present tense ($r = .45$, $p \leq .05$) of patients and an increase in patients' expectations. Additionally, the use of third person singulars by physicians was significantly correlated with a decrease in expectations from T0 to T1 ($r = -.44$, $p \leq .05$) (Figure 2).

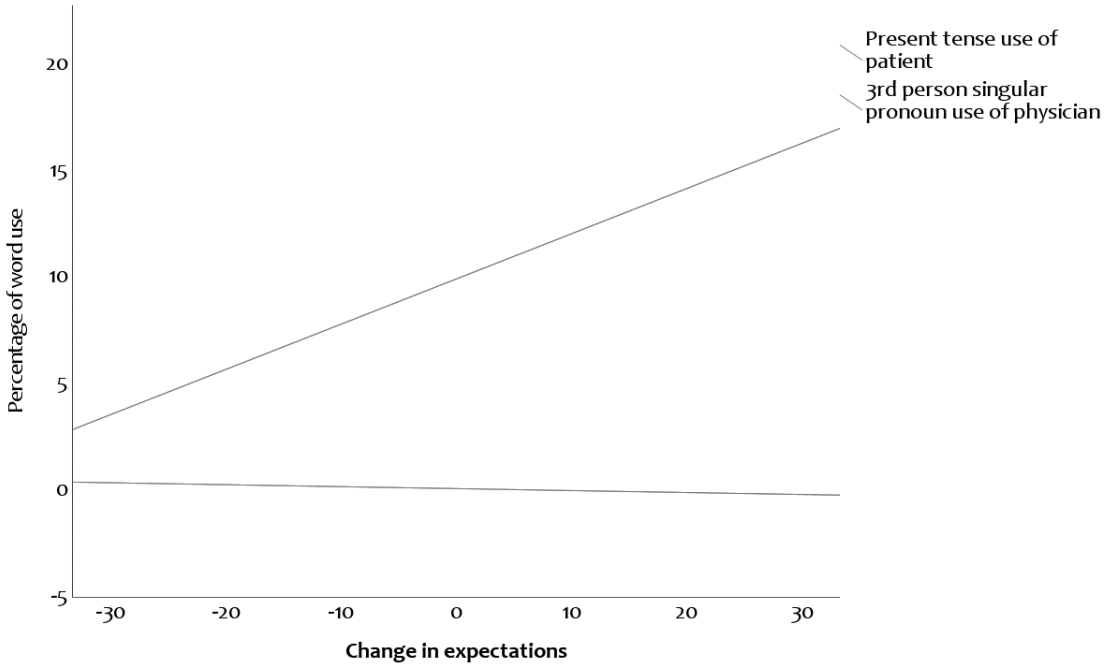

Figure 2. *Relationship between change in expectations from pre-consultation to post-consultation and word use by patients and physicians*

DISCUSSION

The current study is the first to examine whether treatment outcomes or expectations for treatment outcomes are explicitly discussed within orthopedic medical consultations and whether certain linguistic aspects of the doctor-patient communication are related to patients' outcome expectations. In our sample, less than one minute of the medical consultation, that is only 6% of the total duration of the consultation was dedicated to the discussion of outcomes of treatment. Within these fragments, physicians tended to use more words and more words per sentence as compared to their patients. Concerns and needs are mostly non-discussed, despite the fact that patients have high expectations for outcomes of treatment. Our results also indicate that physicians differ with regard to word use in hip and knee patients. They use more (negative) affective wording (e.g., words that relate to sadness) in knee patients than in hip patients. Overall, the patients' use of present tense was related to an increase in expectations post-consultation. Moreover, physicians' use of third person singulars was related to a decrease in expectations.

In line with previous research [169,170], physicians in our sample use far more words (per sentence) than patients. This seems reasonable, as the medical consultation partly serves to explain and educate the patient, about, for example, outcomes of treatment [169]. The focus on an instrumental conversation, with a tendency to concentrate on curing and not caring, could additionally be derived from the general absence of future tense and the physicians' focus on the present [150,170]. Physicians may tend to use more present tense instead of future tense possibly in order to direct the conversation towards a conclusion. Physicians usually have limited time due to time pressure [171] and may, therefore, focus on closing the consultation, rather than exploring the patients' expectations [150,172]. The few expressions that conveyed needs and concerns found in this study support this statement [151-153]. Together, this all could lead to premature closure of the consultation without patients having had the chance to voice all their important concerns and expectations, and a unsatisfactory exploration of the patients' perspective [108,154].

Indeed, treatment outcomes or expectations for treatment outcomes are only briefly discussed in our study. Of the average 15 minutes duration of the medical consultation in our sample, less than 50 seconds were spend on the discussion of the results of treatment. Previous findings denote that expectations have to be discussed in order to assure that patients develop realistic expectations [52,55,102]. However, up to half of the patients have too optimistic expectations of treatment outcomes [51,75-78,173,174]. In accordance with this notion, we found that both hip and knee patients had, on average, high expectations for surgical outcomes both pre- and post-consultation. Moreover, in accordance with earlier research, there were no differences in expectations between hip and knee patients [31,175], even though outcomes prove generally worse for knee patients as compared to hip patients [19,23,29-33,38,52,55-58].

Physicians might be aware of the differences between hip and knee patients, as it was found that they use more words that described negative words and sadness in knee patients than in hip patients. However, it has been suggested that positive words, and not negative words, could lead to a better understanding and better recall of the given information [159], which could help form patients' expectations. This could, in addition to the general lack of discussion of outcomes, explain why no difference in post-consultation expectations were found between hip and knee patients. These findings demonstrate that although expectations did exist, patients fail to disclose their expectations and might do not feel that is appropriate to talk about them [107-110,176,177]. Therefore, in practice, more time should be spend on the general discussion of outcomes, yet specifically on the discussion of outcomes in patients who generally prove to be more dissatisfied, and to obtain less favorable results than others.

One would expect that patients would increase their expectations when using more future focus in their talk, as future focus commonly demonstrates an expectation oriented conversation [150,172]. Nevertheless, it was found that not future focus, but the use of present tense was related to an increase in expectations post-consultation. The present tense is thought to be used when undisclosed events are presented [178]. Patients might use present tense in their wording as to describe the difference

between their current status and what they expect as a result of surgery. For example, one patient indicated, "*We would like to continue doing all sort of things and we are currently hindered in these things, even though it could be resolved*". Perhaps, talking about their symptoms could engage patients in, what is called, 'work of worrying' [179,180]. It has been found that talking and thinking about fear could make you anxious [179,180]. Perhaps, in this study, the same mechanism could establish a relationship between talking and thinking about your current inabilities and symptoms, and additional expectations for the resolution of these problems.

Furthermore, it was found that physicians' use of third person singular pronouns was related to a decrease in expectations. We should be careful when considering this relationship, knowing the low percentage of words used within this category and the marginal change in expectations that is related to it. This finding therefore warrants future replication. However, a possible explanation for the relationship could be as follows: even though part of patients' expectations are thought to be formed through interaction with the physician [101,103,104], it has been found that patients may also rely on information from others (e.g., media, family, and friends) [101,102]. Physicians might, in explaining what could be potential outcomes of surgery refer to other patients' experiences and might thereby be able to lower patients' expectations [169,181-183].

This study has several strengths. It managed to examine the content of the consultation, which is usually only a 'black box' in expectation research. Almost all words within consultations were recognized by the LIWC-program, which indicates that probably no important utterances were missed. Not only was this study able to achieve insights in differences in word use of patients and physicians, but it was also able to connect these insights to self-reports to identify how expectations could be associated with doctor-patient communication. However, the main limitation of this study is that it only assessed word use in isolation. Therefore, some verbs could have been misunderstood without context. For example, plural first person words could be used inclusive ('us' the patient and the physician) and exclusive ('us', physicians, or 'us', patients) [184,185].

In sum, outcomes of surgery are only shortly discussed during consultation. Word use of both patients and physicians suggest a gap in communication. The results indicate that patients might fail to disclose their expectations. However, word use might be related to a change in expectations and future (qualitative) research should therefore aim to examine how doctor-patient communication could serve as a facilitator in making patients' expectations for outcomes of treatment more realistic. Moreover, physicians in practice should focus more on the patients' perspective and their ability to engage patients within the consultation by use of their communication.

CHAPTER 4

THE ONLY SOLUTION: A CONVERSATION-ANALYTIC PERSPECTIVE ON THE INTERACTIONAL SHAPING OF PREOPERATIVE EXPECTATIONS IN AN ORTHOPEDIC PATIENT

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ABSTRACT

A substantial part of orthopedic patients is at risk of being dissatisfied after a seemingly successful surgical procedure. The factor most consistently predicting dissatisfaction is unfulfilled expectations. Most research on the sources of patient expectations focused on factors that lay within patients and formations of expectations pre-visit. Yet, expectations can change during the medical consultation. The physician can also be considered an important source of patients' expectations, being an integral part of the exchange between both parties. Since this research area is relatively unexplored, our study is focused on how patient expectations are treated and negotiated in the ongoing interactions between physicians and patients. Our findings demonstrate that patients usually do not *explicitly* express their expectations or do not express their expectations, *at all*. Yet, physicians do explain what could be expected when opting for joint replacement surgery. However, they often design their utterances in a way in which surgery is presented as the only solution to the patient's complaints. The display of expected results is skewed towards probable benefits of surgery, while disadvantages are often presented shrouded, delayed, and with arguments for the statement provided. The current presentation of (dis)advantages could affect patients' expectations regarding the results of surgery. Patients often see themselves as better than average, which could imply that they think that disadvantages of surgery do not apply to them. Physicians should, therefore, reflect upon their own expectations and invite patients to do so too, in order to be able to discuss them openly.

INTRODUCTION

Research findings denote that up to 28% of orthopedic patients is dissatisfied after a seemingly successful surgical procedure [19,38,52,55,56,186]. This procedure, namely joint replacement, is a highly common treatment for severe end-stage osteoarthritis in the knee or hip, performed respectively up to 25,000 and 30,000 times a year in the Netherlands [3,14,55]. Consequently, each year thousands of orthopedic patients are dissatisfied, and at great risk of perceived insufficient clinical recovery or decreased quality of life [187].

The factor most consistently predicting dissatisfaction among patients is unfulfilled expectations (e.g., [55,77,78,83,122]). About half of the patients who undergo surgery seem to obtain high expectations regarding treatment or its outcomes [51,75,77,78], which might not be met [78]. Therefore, a vast body of literature examined the origin of patient expectations [68,81,84,85,92-95,188]. Most research on these sources of expectations focused on factors that lay within patients and formations of expectations pre-visit. Some researchers recommended unrealistic expectations of patients to be lowered and to have patients better educated [33,189,190] in order to be able to reduce rates of dissatisfaction among patients. The burden of having unrealistic expectations is thereby solely placed on the patient. Yet, expectations are also found to be guided by sources outside the self, such as friends, family, media, and previous treatment [101,102]. In fact, since expectations are not fixed, they can even change during the medical consultation [44,105,106]. Almost 40% of expectations are thought to be formed within the encounter with the physician [101]. The physician consequently can also be considered an important source of patients' expectations, being an integral part of the exchange between both parties. Since this research area is relatively unexplored, our study is focused on how patient expectations are treated and negotiated in the ongoing interactions between physicians and patients.

An interactional perspective on medical consultations

In order to open up the black box of orthopedic conversations, we need a perspective that reveals the fine-grained detail of interaction. Conversation Analysis (henceforth:

CA) is such a perspective. CA focuses on talk-in-interaction in naturally occurring conversations [191]. It is guided by the question "why that now?" (Schegloff and Sacks, 1973: 299): what does the speaker achieve (consciously or not) by choosing this wording at this particular moment in the interaction? Closely studying what is and what is not made accountable on a micro-level provides insight into the norms and expectations that participants orient to, without these participants being necessarily aware of such an orientation. This allows the investigator "to determine how a given outcome of an interaction is achieved, as well as the different ways that it is achieved in that setting" [192], p. 2.

Medical consultations, in general, have been characterized as interactional situations that entail an asymmetry in involvement between patients and physicians [182,193,194]. The medical consultation is highly organized and physicians take their superior entitlement to talk about diagnosis and treatment for granted [142,183,195]. They routinely set the agenda of the meeting and are the ones to propose and ask questions (i.e., they have 'first position') [182]. These questions are often framed in ways that only allow for short answers and inhibit questions asked by patients [182]. Reasoning for recommendation or questioning, and an explanation of diagnosis are usually not provided, resulting in a gap in given information for the patient [182,196,197].

Little research is conducted regarding the interactional patterns within orthopedic consultations. However, the literature shows that, when applied to the orthopedic consultation, a gap in given information is especially present when a treatment option is recommended. Physicians mostly recommend surgery in a simple and uncomplicated way without explanation [198,199]. It is only in some situations that the physician elaborates on the given information. For example, when patients do not immediately accept the physician's treatment recommendation and the physician is therefore unable to move to the closing part of the consultation [200,201]. It is thus only upon encountering the patient's resistance, that orthopedic surgeons will provide additional reasoning for surgery, for example by returning to the evidence from the

physical examination or by proposing the treatment option as the one option that could solve the patient's problem [198,200,201].

In contrast, even though the grounds for recommending surgery are often provided only after patient resistance, orthopedic physicians usually comment on their *non*surgical treatment recommendations, and give additional information, before actually recommending these treatment options [198,199]. These recommendations are mostly not simply stated, but delayed and complicated. In their studies, Hudak et al., [198,199], showed that physicians persuade their patients to opt for their recommendations by providing arguments for nonsurgical treatment in advance, thereby trying to prevent resistance. Moreover, they react differently to patients resisting recommendations for nonsurgical treatment than to patients resisting recommendations for surgical treatment. Instead of expatiating after resistance for nonsurgical treatment, physicians usually simply indicate that surgery might be a treatment recommended in the future.

These differences in physicians' recommendations for, and reactions to resistance for surgical and nonsurgical treatment, show a bias favoring surgical treatment [198,199]. Additional evidence for this bias could be found in the fact that in almost all orthopedic consultations surgery is mentioned, even in consultations in which surgery is not proposed as treatment option [199]. Physicians think that patients expect and favor surgery over non-surgery. Additionally, the physician might think that patients anticipate surgery as treatment option, due to the professional status of the orthopedic surgeon [198]. They therefore frequently focus on the benefits of surgery and generally present surgery as the one real option for the healing of symptoms. Possibly, more patients will accept this recommendation, as a result of the positive framing, as presenting benefits seems associated with less resistance [202]. Moreover, the way of presenting surgery in contrast to nonsurgical treatment options could have an impact on patients' expectations for outcomes of surgery, and might hinder the patients' expression and discussion of low expectations [199].

An interactional perspective on expectations

Dissatisfaction with the outcome of surgery is generally thought to result from unrealistic expectations [55,77,78,83,122]. However, research on the sources of high expectations is mostly concerned with pre-visit factors or fixed factors within the patient [68,85,87,89,90,92,94]. Conversation analytic literature indicates that the way treatment recommendations within orthopedic surgery are designed could possibly influence patients' outcome expectations, as these recommendations are mostly designed as the ultimate solution [198,199]. Moreover, expectations of patients could also be formed by means of a tendency of the physician to comply with socially preferred actions, that is, rather affiliate with the patients' expectations instead of disconfirming them [195,203]. It has been found that disconfirming statements are generally delivered in a more complex way than confirming statements, and often accompanied by something positive to direct the conversation towards closure of the 'bad part' [203-206]. For example, physicians might downgrade the downsides of surgery, or move towards the positive aspects [203,206].

These interactional patterns within medical consultations have to be made visible, as the ways in which surgery (outcomes) is (/are) discussed could (partly) account for the formation or adaptation of outcome expectations. Therefore, this study examines how outcome expectations regarding surgical treatment are discussed within pre-surgery consultations between physicians and orthopedic patients, both with high and low expectations for outcomes of surgery. We build on the research by Hudak et al., regarding the recommendation of surgery and aim to extend it, by looking exclusively at medical consultations with surgery recommendations [198,199]. This focus allows us to get more insight into the interactional patterns that help explain not so much the choice between surgery and non-surgery options, but the specific ways in which the outcome expectations of the surgery itself are being shaped.

Our findings show that patients generally fail to express their outcome expectations during medical consultation. Prior to this study, we conducted a survey in which patients were asked to state their expectations for outcomes of surgery (see 'Data

and method'). Patients with high expectations do not express these expectations in an explicit form during the consultation. Moreover, patients with low expectations mostly do not display expectations *at all* during consultation. Physicians are, in fact, mostly the ones to explain explicitly what could be expected in terms of the outcomes of surgery. In addition to Hudak et al., we found that surgery is not only recommended as the preferred option, but also as the only solution to the patient's problem [198,199]. Physicians present advantages of surgery in one or more of the following manners: (1) straightforward with explicit wording and extreme case formulations, (2) without elaboration, and (3) without delay. In contrast, disadvantages of surgery are displayed: (1) shrouded and mitigated, (2) with accounts for the statement provided, (3), delayed with hesitation and pauses and (4) with contradictory statements. Moreover, physicians display possible benefits of surgery with greater certainty and with superlative words in conversations with patients with low expectations, as compared to within conversations with patients with high expectations, as if they have to pull harder to get these patients on par.

DATA AND METHOD

The corpus consists of 22 recorded Dutch consultations (total of 344.7 minutes) that took place between April 2017 and October 2017, at the department of Orthopedics of the ETZ (Elisabeth-TweeSteden Ziekenhuis), the Netherlands. Patients and physicians were recorded in a pre-surgery consultation. All patients indicated upfront, in a pre-visit questionnaire[1], whether they were expecting surgery as treatment options and what their expectations for outcomes of treatment were. Patients were asked how much improvement they expected in respectively 18 or 19 domains. Answers could range from 0 (*this question does not apply*) to 5 (*complete improvement or back to normal*). The total score could range from

[1] Patients completed the Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES) or the Hospital for Special Surgery Knee Replacement Expectations Survey (HSS-KRES) to indicate their expectations for outcome of treatment

0 to respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value could range from 0% to 100%. Values represent the combined amount of expectations the patient has and the level of these expectations. Higher values indicate more and higher level of expectations. For example, a patient with a score of 100% indicated that (s)he expected, or achieved, maximum improvement, in all domains. Patients were split into two groups, with scores ranging from 0 to 50% and from 50% to 100%. All patients were recommended and eventually scheduled for surgery. The sample represented both male (n = 11) and female (n = 11) patients of different ages (mean age: 67) and different orthopedic surgeons and residents (n = 8, all male).

The study was conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act, and was approved by the local Medical Ethical Review Board. All patients and physicians of the department or Orthopedics were informed about the nature and objectives of the study and gave written informed consent. Identifying content has been removed from transcripts in order to protect participants' and physicians' privacy.

One primary investigator and two research assistants transcribed the recordings. The open source program EXMARaLDA [207] was used to transcribe the data frame by frame according to the Jeffersonian conventions [208]. Doctors', patients' and patient's partners' utterances are respectively displayed by 'dr', 'pt' and 'pr'. Areas of analytical interest were highlighted in the transcripts. These areas concerned interactional sequences about, among others, outcome expectations, the benefits of a certain treatment option and possible complications or drawbacks that could result from intervening. Thereafter, all highlighted areas within a consultation were analyzed one by one using Conversation Analysis. Collections of consistent patterns in the consultations were developed. Of these patterns, the clearest examples are presented and discussed within this paper to illustrate a) how physicians propose surgery to patients, b) how patients express their outcome expectations, c) which

practices physicians use in reaction to patients' expectations, and d) how physicians themselves take outcome expectations within the medical consultations into account. These fragments are in concordance with the interaction patterns observed throughout all medical consultations. The last case shown is examined because it is a so-called deviant case in which the physician thoroughly explains what the downsides of surgery could be. Dutch extracts were translated for the purposes of this paper. The original extracts could be obtained from the authors.

FINDINGS

Patients were divided into two subgroups based on their level of written expectations regarding outcomes of treatment as obtained in the pre-visit questionnaire. That is, 1) patients with high expectations for outcomes of surgery and 2) patients with low expectations for outcomes of surgery. Findings regarding the interactional patterns during medical consultation differ between these two groups. Patients with high expectations display their expectations rarely explicitly and only as indirect hopes and wishes, or as references to what other patients achieved as a result of surgery. Patients with low expectations mostly do not display expectations at all during consultation. Moreover, physicians react differently to patients with high or low expectations. They display possible benefits of surgery with greater certainty and with superlatives in conversations with patients with low expectations, as compared to (conversations with) patients with high expectations.

Patients display implicit cues as to their expectations

Patients rarely explicitly state their expectations during consultation. They merely denote their expectations as indirect cues to what they would want to achieve, even when they indicated, on the pre-visit questionnaire, to have high expectations for outcomes of surgery. Furthermore, when comparing the group of patients with high expectations to the group of patients with low expectations, the latter group is even less of an active participant in the conversation than the patient with high expectations. Most of these patients only receive information from the physician,

acknowledge what they are told and leave the consultation room without stating, either explicitly or implicitly, what they expected.

An example of the implicit way of communicating expectations could be found in extract 1. Directly at the start of the medical consultation, the patient's partner explains their motivation for pursuing this medical consultation. Within these statements, the partner points out that they want improvement in activities of daily living. Additionally, she not only explains what they want to achieve, but in line 11 also states the indirect expectations of an improvement resulting from performing surgery (", (.) even thou↑gh that it >maybe<=remedied ."). 4

Extract 1

```
1   Pr:  yes↑ but that is why I say eh: doctor (0.1) ehh , he was
2        then the (0.2) the (.)>first time< at the general practitioner=and
3        he put him off (.) arth[rosis and]
4   Pt:                         [just get aspi-]
5   Pr:  [just get] aspirins . I say noo::o↑ >I-say< we are not going
6   Pt:  [rins<]
7   Pr:  to do that (.) we are both still happy now↑,
8   Pt:  °yes°
9   Pr:  internally (.) hopefully (.) still in good healt:h(.) WE still
10       Wa:nt to do all sorts of things (.) and now we are > hi↑nd:ered in
11       that↓< , (.) even thou↑gh that it >maybe<=remedied .
```

In extract 2, within the same consultation, another form of an implicit cue, towards patients' expectations of outcome can be found. The patient's partner refers to their neighbor, who had had a joint replacement before and who regretted not having surgery earlier on (lines 17-22). This statement could be explained as an expectation for good outcomes, as the patient's partner might expect the same results the neighbor had achieved.

Extract 2

```
1   Dr:  so
2        (0.7)
3        we tr::↑y to .
4        (0.6)
5        ehhh:: repair it as >good as possible<=and we have a lot of
6        techni:qu=es and we are very fa:r, we are approaching it .
7        < but <as good> (.) as (.) that (.)
8        (0.5)
9        it ever ↑
10       (0.4)
```

```
11      [was made by your mother]
12 Pt:  [no, that will not be possible ] .
13 Dr:  that ehh:: (0.2) that=will be har↓d .
14 Pt:  °absolutely°
15 Dr:  yes . so
16      [°for that reason°]
17 Pr:  [ye::ss]
18      =our neighbor has just been operated b↑y you and she is
19      well::: she says o::oh:::h=
20 Dr:  >no for sure<
21 Pr:  =its a relief=
22 Pt:  =i should have done it years before ?
23 Dr:  no for sure, for sure, that is true, <that is true>, but eh ,
24      (0.3)
25      your own hip does not have the risk of coming ↑out of the bowl, =
26      no risk (.) to infect [at an opera-]
28 Pr:                        [ah yes]
29 Dr:  [-tion]
30 Pt:  [>pay extra attention<]
31 Dr:  AND THAT, that is something that: that comes along wi↑th it, bu::ut
32      the pain will go away , that is ehh .
33      (0.8)
34      remains 10 percent
35      (0.4)
36      of people remains (.) having unexplained pain °after an
37      operation°
38      (0.5)
39      eh, but >that is the< approach of the operation, and if it did
40      not work out, >th↓en< we would not do it ,
41      [so ehh yes]
42 Pr:  [yes]
```

Notably, the patient's partner hesitates at the end of her first sentence (lines 18-22) and continues her statement by indicating that the neighbor said that she would have wanted surgery years before. The patient's partner thereby chooses not to use an explicit way of saying that the neighbor is enthusiastic about the results. This practice was found in multiple consultations: patients implicitly refer to their expectations and good results when describing what they expect to achieve.

Another example of this practice was found in extract 3. This patient does indicate what he expects, but these descriptions are vague and indirect (line 5). Instead of stating that he wants to get rid of the complaints, the patients formulates an 'if .. then' statement: *if* surgery will result in getting rid of my complaints, *then* I would like to have surgery. It is a conditional statement, which provides an implicit clue as to what the patient expects as outcome of surgery.

Extract 3

```
1    Pt:  if it rea↑lly
2         (0.9)
3         is necessary=and:::
4         (1.0)
5         i >can get rid↓ of: it all at ↑once ?
6    Dr:  YES
7    Pt:  >then please< a new one::
8         (0.6)
9    Dr:  ne↑w hip ?
10   Pt:  yes
11   Dr:  [yes,]
12   Pr:  [and that] <↑other th:ing< is a dela↑y:: actu-
13   Dr:  = [yes that is all-]
14   Pt:    [-ally?]
15   Dr:  -temp↑orary eh=looking if we could just continue a little lon:ger
16        in <that w:a:y>
```


Another illustration of this pattern can be found in extract 4. The patient uses an indirect way (line 3) to describe what he wants to achieve. In this fragment, the physician asks what the patient's view is on having surgery. The patient replies with what he expects of the results of treatment, thereby displaying what the largest difference in orientation towards treatment between patients and physicians might be: physicians orient towards the difference between surgery and conservative treatment in their talk, while patients only suggest wanting improvement, but present themselves as indifferent to *how* these results will be achieved.

Extract 4

```
1   Pt:  yes=if I get rid of the pain↓, then eh: .
2        (0.8)
3        °and it will be f↑ine°, then it is a↑1:1: right .
4   Dr:  yes
5        (2.8)
6        I will disc:uss it, >because I always have to< , I am still in
7        trai↑ning = so I always have to discuss everything with ehh my
8        Supervi:sOR ? (.) <but with> this story uhh (.) it >does fit
9        the<=you are otherwise in good health=so that would >then
10       <take pla:ce> in waalwijk .
```

Pushing and pulling towards surgery as the only solution

Physicians' high expectations of surgery, however, are often presented in a straightforward way, without delay and without elaboration. In almost all cases, regardless of the physical condition of the patient, surgery is presented as the only (good) solution for disabled patients. For example, in extract 5, the patient indicates that she wants surgical treatment, as she thinks that her problems will worsen when

she and the physician decide not to interfere. The physician explains that the patient, without surgery, will experience major limitations in daily living (lines 12-16), using explicit wording: "but you >just< have a:::, (1.2) <pardon the words> life that s::u:cks then:::". Reporting this so-called B-event (known to B (the patient), but not to A (the physician)) can be heard to produce a request for information [209], and indeed, the patient confirms the physician's observation that she currently experiences major limitations in daily living. Life after surgery is thereupon contrasted by the physician with life before surgery, and surgery itself is displayed as *the only* way to create quality of life and prevent major limitations (lines 17-21). This conclusion is, however, presented as a summary of the patient's own observation ("So, you will do it (.) >because of<") (line 19), thereby obscuring the driving force of the physician's claims about the patient's states of being.

Extract 5

```
1  Pt:  >EH but if I < con:tinue stu:mbling on ?
2       (0.4)
3       (.)then I >soon< will a↑lso have no knees left any↑more >and and::<
4  Dr:  <that is not tr↑ue
5  Pt:  and I JUST NOW CANNOT do anything no more↓ haha .
6       [haha]
7  Dr:  [that that-]
8       that:: is not true↓, that first thing .
9  Pt:  no:o:: ?
10 Dr:  (0.6)
11      you:::: will not we↑ar out faster: ,
12      (0.5)
13      but you >just< have a:: ,
14      (1.2)
15      <pardon the words>
16      life that s:uc:ks then::: .
17 Pt:  ↑yes, i can't just do anything
18      (0.7)
19 Dr:  so, you will do it (.) >because of<
20      (1.4)
21      the quality ?
22 Pt:  ↑yes
23 Dr:  °yes°
24      that's fi↑ne
```

As with 'good news', high expectations of the physician are often pre-announced [206]. In extract 6, the physician explains there is no other valuable treatment option left for the patient (line 2). He acknowledges the patient's limitations and thereby prepares him for the solution to the problems (lines 4 and 5). The physician makes a

large contrast, an extreme case formulation, between the current problems of the patient and, within the same turn, the expected outcomes of surgery (lines 4 and 5). The current problems of the patient are thereby presented as if they are caused by the disease ('you are so limited now') and surgery could not only provide a good solution for that, but also remove the external cause of the limitation.

The delay in the patient's response (line 7) could be explained by the double action that could be required from the patient upon this contrasting statement, that is, a confirmation of the current limitation and an acceptance of the solution. In lines 7 and 8, the patient explicitly displays his understanding of what could be expected. The patient could have anticipated these expectations as they were forecasted by the physician's announcement, and immediately agrees. The physician treats this as a closing of this part of the consultation ("[>that is how< it is]", line 14), and quickly moves to the next topic on the agenda (line 16). As a result, there is little room offered for further exploration, even though the patient claims to have "a lot of ↑fait:h" (line 15) in the results of surgery, which does not seem in line with the earlier cautiousness of the physician (line 9).

Extract 6

```
1  Dr:  yes no for:: every patient it is ↑then dif:ferent eve::rytime
2       yes for you i have no:th:ing else:: (.) and ehh yes ,
3       (0.8)
4       you are so limited now (.) yes we >just have< a ↑good
5       ↓solution °for° that .
6       (0.7)
7  Pt:  well good uhh:: if it could be the same >as< ehh with the
8       ↑previous one ?
9  Dr:  =YES, ↓that i cannot p:rom:ise you.
10 Pt:  >no no< but good that ehh:::
11      (1.4)
12      if we are going to do the same=then we have to await the result
13      indeed but i [°will=i will somewhere°]
14 Dr:               [>that is how< it is]
15 Pt:  i trust=i have a lot of ↑fait:h
16 Dr:  well ↑good
```

More evidence for the direct way of communicating high expectations for surgery of physicians is given in the following fragments. These fragments concern consultations with patients with low expectations for outcomes. It seems that, even

though patients in this group rarely point out their expectations, physicians in this group are even more explicit in their expectations concerning outcomes of surgery than physicians in the group of patients with high expectations. In extract 3b, the terms of the conditional statement ("if it is really… and I can….then") are confirmed twice by the physician. By saying 'YES' (line 6), the physician confirms that he expects to resolve the patient's problems by performing surgery (lines 9-11). Without further ado, the physician adds that indeed, all other forms of treatment will not resolve the patient's problems, as they are merely postponing the 'real' treatment option (lines 14-16). The physician thus communicates his high expectations in response to the patient's statement in a simple and direct way.

Extract 3b

```
1  Pt:  if it rea↑lly
2       (0.9)
3       is necessary=and:::
4       (1.0)
5       i >can get rid↓ of: it all at ↑once ?
6  Dr:  YES
7  Pt:  >then please< a new one::
8       (0.6)
9  Dr:  ne↑w hip ?
10 Pt:  yes
11 Dr:  [yes,]
12 Pr:  [and that] <↑other th:ing< is a dela↑y:: actu-
13 Dr:  = [yes that is all-]
14 Pt:    [-ally?]
15 Dr:  -temp↑orary eh=looking if we could just continue a little lon:ger
16      in <that w:a:y>
```

In extract 7, again, the physician uses a B-event [209]: a strong contrast is made, with the help of the extreme case formulation 'completely' [210] between the current situation of the patient ("if the PAIN: is:: affecting you ehh , completely (.) determines your life ., lines 6-9) and the expected outcomes of surgery ("THOSE people are the people who ehh will (.) be happy with a ↑knee prosthetic", lines 11-13). The physician uses superlative words to invigorate his statements. Interestingly, within this fragment, the physician does not say 'knee prosthetic', but 'new knee prosthetic', thereby additionally implying that the patient's knee will be 'as new' after surgery. He explains that surgery particularly brings a solution for patients within a specific category ("THOSE people"), without explicitly concluding that this

specific patient belongs to that category. This can be heard to produce a request for acceptance of the belonging of the patient to that category. Indeed, the patient agrees that the pain completely determines his life (line 10).

Extract 7

```
1  Dr:  .hhh ehmm i do not have another (.) solution as you hope then
2       the one that i su:ggested: at that time
3       (0.4)
4       ehmm a::nd and then we have with a n:ew knee pros↓thetic
5  Pt:  =YES ?
6  Dr:  ehh well >that is a< good solution if the PAIN: is::
7       affecting you ehh ,
8  Pt:  =yes
9  Dr:  completely (.) determines your life .
10 Pt:  yes
11 Dr:  =if you could walk only for a couple hundred meters ...hhh THOSE
12      people are the people who ehh will (.) be happy
13      with a ↑knee prosthetic
```


Physicians' complicated display of possible downsides of surgery

In extract 2b, prior to the patient's partner's reference to the results of their neighbor's surgery, the physician explains, without stating the obvious, that the outcomes of surgery will not be as good as the patient's hip was before the onset of the disease (lines 7-12). He prefaces his statement regarding the downside of surgery, by explaining that even though the techniques are good, they will not be able to resemble the knee as was made by nature (lines 5-7). This contrast between 'nature' and 'surgery', which is provided by the physician seems logical and therefore provokes a confirmation from the patient (lines 12-14). The physician designs his statement as a minimal downside of surgery, by indirectly describing it and by not using the term 'less', but not 'as good as' instead (line 7). The display of disadvantages is subsequently shrouded (lines 7-14).

Extract 2b

```
1  Dr:  so
2       (0.7)
3       we tr::↑y to .
4       (0.6)
5       ehhh:: repair it as >good as possible<=and we have a lot of
6       techni:qu=es and we are very fa:r, we are approaching it .
7       < but <as good> (.) as (.) that (.)
8       (0.5)
9       it ever ↑
```

```
10      (0.4)
11      [was made by your mother]
12 Pt:  [no, that will not be possible ] .
13 Dr:  that ehh:: (0.2) that=will be har↓d .
14 Pt:  °absolutely°
15 Dr:  yes . so
16      [°for that reason°]
17 Pr:  [ye::ss]
18      =our neighbor has just been operated b↑y you and she is
19      well::: she says o::oh:::h=
20 Dr:  >no for sure<
21 Pr:  =its a relief=
22 Pt:  =i should have done it years before ?
23 Dr:  no for sure, for sure, that is true, <that is true>, but eh ,
24      (0.3)
25      your own hip does not have the risk of coming ↑out of the bowl, =
26      no risk (.) to infect [at an opera-]
28 Pr:                        [ah yes]
29 Dr:  [-tion]
30 Pt:  [>pay extra attention<]
31 Dr:  AND THAT, that is something that: that comes along wi↑th it, bu::ut
32      the pain will go away , that is ehh .
33      (0.8)
34      remains 10 percent
35      (0.4)
36      of people remains (.) having unexplained pain °after an
37      operation°
38      (0.5)
39      eh, but >that is the< approach of the operation, and if it did
40      not work out, >th↓en< we would not do it ,
41      [so ehh yes]
42 Pr:  [yes]
```

In reaction to the display of 'low' expectations of the physician, the patient and his partner show resistance, as their expectations seem contrary to what is currently displayed by the physician as possible outcomes (lines 18-22). The physician thereupon agrees with the notion that surgery could provide beneficial outcomes. After a short pause, he returns to his critical view on surgery (line 25). As was found with the general recommendations for nonsurgical treatment, the physician here gives additional information supporting his claim before actually making it [198,199], thereby inviting patients to accept the downsides of surgery. Furthermore, even though the physician holds on to his view on the downsides of surgery from line 26 onwards, he, within the same turn, provides additional argumentation for why surgery would 'fix' the problems and thereby contradicts his previous statements. The patient and partner immediately, and in overlap with the physician's 'So' accept this (line 42).

What is additionally illustrated in this second part of fragment 2b is the hesitation and mitigation with which the downsides of surgery are being explicated (line 31). This is in sharp contrast to what could be found in the above-mentioned display of the *advantages* of surgery [206]. Advantages of surgery do not require preparation, are easily delivered and patients can often follow what this statements mean and thus often agree with it [206]. The shrouded and mitigated drawback delivery might, in contrast, result in patients responding neutral or reservedly, as they may not understand the implications of these statements [206].

In extract 8, the utterance regarding patients '*not liking it*' (line 5) is not stated outright and is minimalized. On the one hand, the physician delays the actual display of the disadvantage and hesitates to tell. The patient, on the other hand, moves on and asks with a continuer for clarity (line 7). However, the delivery of the actual drawback statement does not make clear what it is that patients do not like (line 11), even though it seemed that the physician tried to add clarification (line 9). The delivery of this low expectation is circumspect and explicit negative utterances are avoided. Besides, he provides arguments for why he is informing the patient about possible downsides of surgery. In lines 13 and 14, he explains that he is not informing the patient because he wants to temper her expectations. He is mainly telling the patient because the patient 'has to know'. He thereby accounts for the expression of the downsides of surgery, and indicates that it is not the norm to experience disadvantages. By bringing this up in this particular way, he suggests to just say it by way of precaution and not because it necessarily applies to that particular patient.

Extract 8

```
1  Dr   <twenty percent> of the people who have a
2       (0.6)
3       hip prosthetic> say< ye↑s . well yeah , n↓o I ehh
4       (0.7)
5       act↑ually >DO NOT< ↑like it ?
6       (1.0)
7  Pt:  hmy:es:
8       (1.2)
9  Dr:  and:: what causes >that then< ?
10      well yes, sometimes in expectations pe:rha:ps or (.) in
        complications ?
11      (.) BUut it is >not a< (.) hundred percent party
```

```
12      (0.9)
13      that you should know (.) and if you know and understand it, then
14      yes , I think it is °fine°
15      (0.8)
16      then nobody will >you-we< will do a hip tomorrow ?
17      (1.2)
18      everyone will think it is ↑okay
19      (1.3)
20      °eh° , BEcause you are otherwise entirely healthy ?
21      [I think:: ?]
22 Pt:  [yes]
```

In extract 9, which is a continuation of the medical consultation with the patients with low expectations in extract 7, the recovery period is being discussed by the physician. Nonetheless, in accordance with the display of 'low' expectations by the physicians in the group of patients with high expectations, this is done with many contradicting statements. The physician firstly indicates that after six weeks most patients are finished walking with crutches, notwithstanding that some patients go faster than other patients (lines 1-3). However, he then quickly states that this is no matter of importance, thereby discounting the variability in recovery time (line 4). The patient, nonetheless, does not simply accept this (line 5). Thereupon, the physician emphasizes that after the first six weeks more recovery still has to come, which is in slight contrast to his very first statement (lines 6-10). The patient acknowledges this, as this is probably more in line with his own 'low' expectations than the statements done by the physician before. Nevertheless, more contradictions are coming, when the physician first indicates that as early as three weeks post-surgery most patients function really well (lines 12 and13), and then in contrast states that recovery could last up to one year after surgery (lines 17 and 18). In the remainder of the fragment, the patient, who has indicated low expectations for the outcomes of surgery in the survey, goes along with the contradictions, by only using continuers.

Extract 9

```
1  Dr:  >the first< six weeks with crutch:es (.) and thereafter they will
2       be phased out. on↑e: faster than the other (.)
3  Pt:  °yes°
4  Dr:  but::: that-that all does not matter
5  Pt:  SO, YOU CAN tell me hardly an:ything ?
6  Dr:  y::es after six weeks it [°is roughly°]
7  Pt:                            [yes, yes]
8  Dr:  (.) then, you are not qu↑ite th're yet
9  Pt:  no::
```

```
10 Dr:  and after that you will cont↑inue practicing ,
11 Pt:  yes .
12 Dr:  after three weeks most people are again, that they say now
13      it goes quite well again
14 Pt:  >hmm<
15 Dr:  now I can do m' things again=
16 Pt:  =yes
17 Dr:  Eh:::: but that still goes on >up till< one YEAR after the
18      [operation]
19 Pt:  [yes, yes]
```

In extract 10, another contradiction in the presentation of disadvantages can be seen. The physician explains that some people will experience temporary problems, and others will experience lasting ones (lines 1-3). Even though the statement seems of considerable importance, it is being discarded as largely irrelevant, as it rarely happens. As the physician closes his turn by stating that it hardly happens to any patient, the patient accepts the last statement, thereby apparently also dismissing the disadvantages the physician told him of before (line 5). The physician, because of the acceptance of these expectations, does not need to do further work and is able to move on with the next topic on the agenda [211].

Extract 10

```
1  Dr:  >encounter problems because of th↑at:=often temporary of nature
2       b↑ut:: sometimes even la↑sting=In the worst case (.) you have a
3       remaining foot drop=Even that is intimidation=it happens alm::ost
4       never.<
5  Pt:  [okay ah that way yes .]
6  Dr:  [exactly.]
```

A deviant case

The following fragments are drawn from one consultation and are exceptional in that the surgeon's explanation of disadvantages is not displayed shrouded, mitigated and with contradictory statements. Moreover, disadvantages are not delayed, and presented with hesitations and pauses, but displayed straightforwardly with explicit wording. This deviant case indicates that this other way of presenting and discussing surgery outcomes during consultation could result in more space for exploring the advantages and disadvantages of surgery. Furthermore, it leads to a more thorough discussion of uncertainties of surgery and surgery outcomes. Thereby, a clear

presentation was given to the patient of what life could be with and without surgery, so that the patient could make a well-informed decision.

The physician, in the preceding part of the consultation (not shown), thoroughly inquired with the patient about her complaints and asked her what she expected from the treatment. The patient then, explicitly, points out that she indicated high expectations in the questionnaire pre-consultation; she expected the outcomes to be perfect. Extract 11 begins right after the patient's expression of high expectations. The physician begins by confirming the patient's treatment expectation (line 1). As could be deduced from his subsequent response to the patient (lines 3-4), he deliberately chose to use the word 'new' hip to describe the treatment option, instead of, for example, 'hip prosthetic' or simply 'surgical treatment'. The utterance of the physician indicates that he was awaiting a positive response of the patient (i.e., an agreement regarding the expectation of a 'new' hip), as he immediately continues to explain that a 'new' hip as treatment will not be possible, that it is an 'artificial' hip which you should expect to receive. Before, we saw that advantages of surgery were sometimes pre-announced, like general 'good news' mostly is [206]. In this case, however, the *disadvantages* of surgery are pre-announced (lines 3-4). The physician thereby creates a possibility within the interaction to put this topic on the agenda.
The patient simply complies (line 5) and instead of accepting the closing of this part of the conversation, the physician continues with his agenda. He explains to the patient why he chose to make a distinction between a 'new' knee and an 'artificial' or 'prosthetic' knee (lines 6-11). The difference, according to the physician, is the fact that along with a knee prosthetic there will be disadvantages. He displays these disadvantages not as a minimalized downside of surgery, but as explicit statements about what could go wrong. Moreover, not only does the physician explain these disadvantages without being asked for it, he also persists in his view on the limitations of receiving surgery, even though the patient in line 16 resists the downsides of surgery by expressing that she would want to continue coming along for another 25 years. The patient, at this point, does not respond differently than other patients in the corpus.

Another exception regarding the display of advantages versus disadvantages could be found within this fragment, as the physician does not only explicitly discuss the downsides of surgery, he, in addition, tries to give the patient a nuanced view on the probable results of surgery (lines 19-24). That is, most of the patients will be satisfied. However, the physician could not guarantee that this particular patient will be satisfied, as there is a reasonable chance that this patient will not be satisfied.

Extract 11

```
1  Dr:  so, you exp:ect a NEw hip ?
2  Pt:  i expect a ↑new hip ?
3  Dr:  and what if i say >that we do not have new hips but only<
4       hip prosthetics ?
5  Pt:  okay, then will be it a hip prosthetic hahahahaha
6  Dr:  no where >we-there< is a difference (.) a new hip >that is
7       for our good lord< [that is your own hip .]
8  Pt:                     [THAT I get .]
9       °i get that°
10 Dr:  and a HIP PROsthetic that costs an operation (0.2) at an
11      operation will some things will(.)not go as we wanted them to go .
12      (0.2)
13      blood vessels (.) <nerves> (.) <fractures> (.) ehh <infections>
14      (.) is DRAmatic
15      (1.2)
16      a hip:::prosthetic comes more easy out of the bowl than a real
17      hip (.) so particular movements should no:t be made
18      (1.2)
19      and a hip prosthetic wears out in the <long> (.) term
20      (0.2)
21      so that is why I say >it is not a <new hip> it is a< hip prosthetic
22 Pt:  =yes, i want the knee to ↓last for at least twenty-five years so
23      (0.4)
24 Dr:  ehh i can not find that guarantee anywhere ?
25 Pt:  no:o:oo ?
26 Dr:  [hahahaha]
27 Pt:  [hahahaha]
28      oh that is a pitty
29 Dr:  no. hhh look and:: prosthetics will go on the long term also
30      loosen up >but yes if that< will be in about twenty years then it::
31      is fine (.)but that is ↑also something i can ↓not guarantee .
32 Pt:  no °no::°
33 Dr:  ninety percent of the hips (.) ↑that we ↓place lasts longer
34      than 10 years ↓TEn percent will not .
```

Within the following fragment, within the same consultation, the physician elaborates on his expectations for outcomes of joint replacement. Similar to the display of disadvantages in earlier fragments, he uses an indirect way to explain what could result after surgery. Nevertheless, he uses this indirect way in a different way. Rather than using the indirect statement in explaining *what* could go wrong, to

disguise the possible disappointing results, he uses it as to clarify *why* results could possibly be disappointing. He compares having an 'artificial' knee to how you should take care of actual 'art'. This means that you have to be careful and that you might have to give up things that you could have done with a 'new' knee. The patient no longer resists the 'disadvantages' of surgery and the patient copies the words of the physician, which might indicate that the patient is on par with this explanation and the examples provided [156,157]. This deviant case indicates that this other way of presenting and discussing surgery outcomes during consultation could result in an agreed and balanced opinion about expected surgery outcomes.

Extract 12

```
1  Dr:  >anyway with< a hip prosthetic you have to <live:: as> if it art
2       (0.5)
3       you hang art on the wall >ehh you handle that< with ca:r:e(.)
4       so you are not going to do all k:ind:s (.) of heavy things with
5       it=you you ↓not to jump and that going you not (.) that ↑have you
6       Carefully are ↓not going to jump with that and you are not (.)
7       going to you ↑have to ↓live carefully with it .
8       (0.2)
9       that is also a disadvantage of a hip prosthetic (0.2) a certain
10      lifestyle comes along with it (1.), that perhaps is ↑lesser (0.5)
11      in terms of activities=than you ↑have now .
12 Pt:  =yes
13 Dr:  he he hhhhe:: a truck driver that j:ump:s of his his his
14      his his cabin all the time 0.7) that are thus things >that
15      those are things< he should better ↑not ↓do
16      (0.2)
17 Pt:  ↓oh
18 Dr:  ehhh:::: playing volleyball (0.2) or jumping
19 Pt:  I better ↑not ↓do [that]
20 Dr:                     [that should]
21      you better not ↑do
22      (0.4)
23      playing tennis ↑well:: on plastic perhaps not >so convenient< but
24      double on the >net and gravel< ↑might be ↑so .
25 Pt:  oh::
26 Dr:  so that is just ↑slightly different
```

DISCUSSION

Dissatisfaction with the outcomes of treatment is often associated with patients having unfulfilled expectations[55,77,78,83,122]. However, patients often seem to obtain high expectations regarding treatment outcomes [51,75,77,78], which might not be met [78]. A considerable part of these expectations is thought to be formed *within* the medical

consultation with the physician [44,101,103-106]. Nevertheless, to the best of our knowledge, no study before examined how patient expectations of outcomes of treatment are treated and negotiated in the ongoing interactions between physicians and patients. This study therefore aimed to get more insight into the interactional patterns that help explain the specific ways in which the outcome expectations of surgery are being shaped.

Patients with high expectations for outcomes of treatment usually do not *explicitly* express their expectations, and patients with low expectations for treatment outcomes do not express their expectations *at all*. Physicians, however, do explain what could be expected when opting for joint replacement surgery. Yet, they often design their utterances in such a way that surgery is presented as the only real solution to the patient's complaints. Moreover, they use extreme terms to present a pre-surgical situation of limitations in daily living and quality of life, that could be resolved by surgery, even though they mostly leave the conclusion of patients meeting this pre-surgical situation to the patients' themselves. The guidance of the physician is, therefore, difficult to discuss and difficult to see.

A clear difference between the physician's presentation of advantages and disadvantages was found. Advantages of surgery are often presented (1) straightforward with explicit wording and extreme case formulations, (2) without elaboration and (3) without delay, while disadvantages of surgery are displayed: (1) shrouded and mitigated, (2) with arguments for the statement provided, (3), delayed with hesitation and pauses, and (4) with contradictory statements. Moreover, physicians generally present advantages of surgery with superlatives and certainty in patients with low outcome expectations, as compared to patients with high outcome expectations.

Patients often expect high treatment outcomes [51,75,77,78]. Nonetheless, even though patients in our study did indicate to expect beneficial outcomes, they, during consultation, tend not to express these expectations in first position. Most patients

only passively receive information, acknowledge what has been told, and consequently leave the interaction without presenting their perspective. It is only sometimes, after the physician presented his expectations, or described the patients' life as limited by the disease, that patients confirm their high expectations. Previous findings denote that patients usually show little entitlement to treatment options or their outcomes [212]. Therefore, when they do express their perspective, they often produce statements that only indirectly or implicitly refer to their expectations [212,213]. For instance, in our study, one patient referred to the beneficial outcomes her neighbor experienced by cause of surgery. The disclosure of expectations might be suppressed by a belief that there will be no solution for the problem, a fear of being a burden to the doctor or coming across as pathetic or ungrateful [110]. Moreover, patients might also be worried that they are not allowed to express their concerns [110].

The general absence of patients' explicit expressions of their perspective was reported earlier. Only 10% of all utterances in the consultation center on the patients' concerns and only 11-25% of patients manage to present all their concerns [108,141]. Low involvement of patients could be inherent to the general asymmetry in the interaction of the medical consultation [182,193,194]. Physicians are often the ones to propose and ask questions, which are often framed in a way that only allow for short answers [182]. The absence of open-ended questions or solicitation to voice the concerns compromises for up to 50% of causes for nondisclosure [176,214]. Furthermore, involvement of patients remains low by, what is called a 'context stripping' approach; medical consultations rarely focus on subjective experiences and personal perceptions, as for example expectations [182,215].

Still, when patients' expectations are not expressed explicitly, physicians might be able to experience these expectations. For example, while in another study only 1% of patients expressed a direct expectation to receive antibiotics, the physician perceived the request for antibiotics as uttered in one-third of the time [112]. Similarly, even though in our sample patients' expectations were mostly not expressed, physicians treat high and low expecting patients differently. Physicians displayed their expectations for

joint replacement outcomes with more certainty, as with more vigor, in consultations with patients with low expectations, as compared to consultations with high expecting patients. They used more exaggerated words, as if they felt that they needed to make more of an effort to convince these patients of their 'only solution'.

In general, the physicians' expression of what could be expected after joint replacement surgery is often skewed towards the beneficial end of expected outcomes. Physicians almost routinely use extreme case formulations so as to display a sharp contrast between the patient's current situation and the ideal, expected situation resulting from surgery. Remarkably, this rosy view on the *expected outcomes* of surgery is in accordance with previous findings regarding the display of *recommendations* for surgery versus non-surgery [198,199]. Beneficial expected outcomes are often stated in simple and uncomplicated ways, just as recommendations for surgery [198,199]. In contrast, disadvantages are often presented in complicated and contradictory manners. Likewise, recommendations against surgery are also not simply stated [198,199].

An explanation for these differences between either recommending surgery versus non-surgery, and between presenting advantages versus non-advantages might be related to patients' reasons to consult an orthopedic surgeon. Patients often consult a doctor in order to legitimate their illness [216]. Treatment brings confirmation for this illness [165,217]. It is likely that physicians perceive some kind of pressure to recommend surgery and actually recommend surgery in order to avoid conflict about the necessity for treatment [171,199,218-220]. It seems reasonable, then, that the non-recommendation of surgery is characterized by more interactional work than the recommendation of surgery. Moreover, voicing disadvantages of treatment might then sound as an argument leading to the non-recommendation of surgery, which is why disadvantages might require more interactional work than an explanation of the advantages of surgery. Another explanation for the differences in recommendations might lay within the nature of the physicians' profession. All physicians within our consultations are orthopedic surgeons; it is part of their job to perform surgery on

patients. Therefore, they might orient towards surgery in their communication and might expect patients to account for the recommendation of surgery as well [199].

Physicians and patients often engage in a pattern in which the physician states the downsides of surgery, which are subsequently rejected by the patient, as if these disadvantages of surgery do not fit their own situation. Thereupon, the physician states that, indeed, there will be advantages to surgery and it is not the norm to experience disadvantages. This is in accordance with previous findings regarding the delivery of general disconfirming statements. This type of statement is often delivered more complexly and mostly in conjunction with something positive to direct the conversation towards closure of the 'bad part' [203-206]. In addition, physicians might have a tendency to comply with socially preferred actions, that is, rather affiliate with the patient's assumed expectations instead of disconfirming them [195,203].

The current presentation of disadvantages affects patients' expectations regarding the results of surgery. Physicians, in practice, should therefore reflect upon their communication practices and their own expectations. Patients often see themselves as better-than-average, which could imply that, due to the hesitation, mitigation and contradictions, they think that the disadvantages of surgery would not apply to them [221]. When asked, patients often expect greater benefits for themselves than for the average other patient [221]. Physicians, in practice, should therefore invite patients to express their expectations, in order to be able to openly discuss the feasibility of patients' expectations, and be more transparent about their own. In fact, openly discussing patients' expectations is one of the practices that is repeatedly reported as the best way to prevent the formation of unrealistic expectations (e.g., [52,55,72,77,92,222]). Moreover, not only should disadvantages be displayed more like advantages of surgery are displayed, but they should also be targeted at that specific patient, so that patients could understand what disadvantages do apply, or possibly could apply to them, and not only to the other patients.

To conclude, our study found that patients mostly do not express their expectations for the outcomes of surgery. In contrast, physicians do point out what they expected. However, the display of expected results is skewed towards probable benefits of surgery, while disadvantages are often presented shrouded, delayed and with arguments for the presenting or disadvantages provided. Large contrasts are displayed between a situation with limitations in daily living and the only solution for these limitations, which is surgery. The non-expression and non-discussion of expectations for outcomes of surgery might be attributed to the general asymmetry within medical consultations and to patients' and physicians' assumptions regarding surgery, resulting from patients being referred to a physician who in his profession is an orthopedic *surgeon.* However, patients and physicians should be encouraged to thoroughly and jointly discuss the expected results of surgery. Therefore, in clinical practice, emphasis should be placed at the context of the medical consultations through which patients' and physicians' expectations are being shaped. Moreover, more attention should be paid towards the differences in interactional patterns that are involved with the display of either advantages or disadvantages of surgery. Physicians should then be trained in recognizing these patterns and patients should be informed about their role in displaying their perspective, in order to be able to present and receive a balanced view on probable outcomes of joint replacement surgery.

CHAPTER 5

EXPECTATIONS IN HIP AND KNEE ARTHROPLASTY PATIENTS AND THEIR PHYSICIANS OVER TIME: WHICH FACTORS ARE ASSOCIATED WITH DISCREPANCY?

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ABSTRACT

Introduction – Orthopedic patients' and physicians' expectations for outcomes of surgery are frequently not aligned. Findings in the literature regarding origin and categories of non-alignment in expectations are mostly inconclusive. This prospective observational study aimed to examine alignment over time and the origins of non-alignment between different outcome expectations in hip and knee patients and their physicians.

Methods – Hip and knee patients (N=477) were included at the Department of Orthopedics. Patients' pre-operative expectations of outcomes of surgery, their functional status, and possible information sources were examined. Physicians indicated their expectations of outcomes of surgery for each patient, and their years of experience and arthroplasty volume were measured. Different multilevel growth models were used to examine (origins of) non-alignment over time.

Results – In at least 74% of cases, a clinical meaningful difference was found between physicians' and patients' expectations. Agreement in expectations does not change over time. Higher functional disability of patients relates to better alignment in expectations and male patients, as compared to female patients, have higher expectations than their physicians.

Conclusion - Patients and physicians usually differ on expectations for surgical outcomes, except when patients report higher functional disability. Alignment in expectations does not change over time, regardless of information provided by a physician or other information sources. Physicians should discuss expectations with patients in order to be able to inform them about their different abilities to improve after surgery.

INTRODUCTION

The rates of total knee arthroplasties (TKA) and total hip arthroplasties (THA) have increased globally during the past twenty years [115,116]. In 2017, approximately 30,000 primary knee or hip replacement surgeries were performed in the Netherlands, which is an increase of almost one-third compared to 20 years ago [27]. Joint replacement in the knee and hip is a common treatment for end-stage osteoarthritis [19-24] with high clinical success rates [21,22,24]. Less than 6% of patients needs revision surgery within 9 years [27,223] and up to 90 percent of patients improve in function after the replacement of the affected joint [20].

Historically, the determination of success of joint replacement largely depended on the view of the physician, that is, on clinical outcomes [38-40]. Nowadays, the patient perspective has become more important [38-40]. However, physicians and patients disagree on the success of treatment, with patients generally being less satisfied than physicians [51-54]. More than one-fourth of patients describe some degree of dissatisfaction after surgery [19,38,52,55-57]. The most important factor associated with dissatisfaction post-surgery among patients is the presence of unrealistically high outcome expectations [77,83,122,224]. Unfortunately, half of orthopedic patients have too optimistic expectations for outcomes of treatment which are unfulfilled after surgery [75,78] .

Patients and physicians differ on what to expect for surgical outcomes [224-229]. Physicians are often considered as experts on what to expect and differences between expectations of patients and physician seems rather a sign of patients having unrealistically high outcome expectations than physicians having unrealistically low outcome expectations [226,230]. When educational programs, aimed at lowering expectations (i.e., aiming at making them more realistic) were offered to patients, it resulted in more alignment between patients' and physicians' expectations for treatment outcomes [92,226,228,229]. Nevertheless, to the best of our knowledge, no known study before examined whether alignment in expectations

between patients and physicians changes over time, possibly as a result of given education and information during and after medical consultation.

Moreover, it seems that the explanation of non-alignment in treatment outcome expectations is more complicated than patients just having unrealistic expectations. Several factors are proposed that could explain the differences in expectations between patients and physicians. For example, patients often rely on psychological sources for their expectations, while physicians rely on medical criteria [224]. Moreover, female patients often have more accordance with their physician [228] and patients with higher functional disability and their physicians have less aligned expectations [39,89]. In addition, some suggest that higher arthroplasty volume is related to higher expectations of physicians [39,231], while others did not found this relationship [232]. Furthermore, it is well known that outcomes differ between TKA and THA patients [23,29-33]. TKA patients have less fulfilled expectations, have lower and slower improvement rates, have more pain and are more dissatisfied than THA patients [23,29-33,58], although level of pre-operative expectations does not differ between the groups [31,175]. This may also explain the inconclusive and conflicting findings in the literature, as most research is conducted on either one of the patient groups [39,89,224,228].

Conflicting findings in the literature are not only reported regarding the origin of disagreement between patients' and physicians' outcome expectations, but as well with regard to the category of expectations with highest alignment between patients and physicians. Pain is sometimes found to be the category with the most alignment [224] and sometimes with the least alignment [230]. Moreover, expectations for improvement in stiffness [224], function, symptoms [224] and recreational activities[39,89] have also been found to be the category on which patients and physicians mostly differ.

Non-alignment between patients' and physicians' expectations of treatment outcomes is associated with more dissatisfaction with outcome after TKA and THA [89,224,232]. Nonetheless, findings in the literature regarding origin and categories of non-

alignment in outcome expectations are mostly inconclusive. In addition, it is unclear whether alignment in expectations differs between different time points, that is, before consultation, after consultation and directly before surgery. This study is, to our knowledge, the first to examine alignment in patients' and physicians' expectations over time, incorporating not only a general measure of expectations, but also item-specific alignment in expectations. Moreover, it aims to provide new information regarding the origin of non-alignment in expectations.

METHODS

Data for this paper was collected between November 2016 and September 2018. Data collection was part of the EXPECT-study, a prospective cohort study examining the relationship between expectations and satisfaction in osteoarthritis patients, conducted at the Department of Orthopedics of the ETZ (Elisabeth-TweeSteden Hospital), the Netherlands. This study was conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act (WMO), and was approved by the local Medical Ethics Review Board.

Participants

Patients who were referred by a general practitioner with symptoms of osteoarthritis of the hip or knee to the Department of Orthopedics were consecutively included at first medical consultation with the orthopedic physician. Patients were excluded from the study when they were unable to understand or complete the questionnaires (e.g., when having insufficient knowledge of the Dutch language or when suffering from severe cognitive impairment (e.g., dementia)). Included patients who received no diagnosis of osteoarthritis after medical consultation were excluded from analysis and the remainder of the study. Only data of patients who received surgery as treatment for their osteoarthritis was used in this paper. Pre-consultation data (T0) of patients who did not had indicated they expected surgery as treatment were omitted from analyses, as their outcome expectations could have been directed towards treatment options other than surgery.

Procedure

Patients willing to participate were asked to complete the first questionnaire (T0) before the consultation, indicating what their expectations of treatment outcomes (the Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES) [126] or the Hospital for Special Surgery Knee Replacement Expectations Survey (HSS-KRES) [86]) would be. Demographical data of patients (i.e., age, sex, employment status, marital status, and engagement in sports) and physician-related data (i.e., arthroplasty volume per year and years of experience) were also collected. Subsequently, patients received a second questionnaire set 1 week post-consultation (T1) assessing their current functional status (the Hip injury and Osteoarthritis Outcome Score (HOOS) [128] or the Knee injury and Osteoarthritis Outcome Score (KOOS) [129]) and their expectations for surgery outcomes. Patients received a third questionnaire set 1 week pre-surgery (T2) assessing their expectations for treatment outcomes and possible sources of information regarding treatment or treatment outcomes. Physicians were asked to indicate their expectations for treatment outcomes for each of their patients.

Measures

Expectations

The HSS-HRES [126] and the HSS-KRES [86] were developed by Mancuso et al. to assess pre-operative expectations. Hip and knee patients were asked how much improvement they expected in respectively 18 or 19 domains. Answers could range from 0 (*this question does not apply*) and 1 (*I do not have this expectation*) to 5 (*complete improvement or back to normal*). The total score could range from 0 to respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value represents the combined amount of expectations the patient has and the level of these expectations. For example, a patient with a score of 100% indicated that (s)he expected maximum improvement, in all domains. Physicians completed an adapted version [89] of the HSS-HRES and HSS-KRES directly after the medical consultation, with the modification as

follows: "How much relief or improvement seems realistic to you in the following areas as a result of treatment for this specific patient?". The items and answer options are identical to that of patients. In order to compare patients' and physicians' scores, the items considered "not applicable" by patients are considered "not applicable" in the physicians' assessment also [89]. The Dutch version of this questionnaire showed good test-retest reliability and good internal consistency[127].

Functional status

The HOOS [128] and KOOS [129] were used to assess functional status. The questionnaires consist of 42 and 40 items, respectively, which could be divided into 3 WOMAC [233] subscales (pain, stiffness and function). Only the function subscale was used in this article. Participants had to indicate on a 5-point Likert-scale whether they experienced the problems presented during the last week. Total scores were derived by summing the answers. Scores could range from 0-68, with higher scores indicating higher physical disability. The scales have good psychometric properties [128,129]

Information

Patients were asked four questions to indicate whether they had gathered information regarding surgery or surgical outcomes: (1) "Did you read the information folder which was given to you?", (2) "Did you attend the organized educational information meeting regarding your surgery and recovery?", (3) "Did you actively search for information on, for example the Internet or books, regarding the surgery, recovery or what to expect, yourself?", and (4) "Did you spoke to patients who already underwent hip or knee replacement, for example, regarding their experiences?". Patients could either answer yes or no.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 24. A 0.05 level of significance was applied to evaluate statistical significance. Missing value analyses were conducted to examine patterns in missing values on expectation scores at T0, T1 and T2. Means and standard deviations (SDs) were calculated for continuous

demographic and expectations variables, and frequencies for categorical demographic variables. A number of independent T-tests were conducted to examine differences between hip and knee patients on demographics, expectations, function and sources of information collection.

Expectations and alignment in expectations

Three different measures of alignment were calculated with use of the total expectation scores of patients and physicians. The first variable was calculated by subtracting the total expectation scores of patients from that of their physicians [224]. The resulting score could range from -100% to +100%. Lower scores represent higher expectations of patients and higher scores indicate higher scores of physicians. This variable essentially displays the direction of differences in expectations.

A second measure of alignment was calculated, by transforming the scores of the first alignment variable (i.e.,-100% to +100%) to absolute values. Thus, the resulting scores could range from 0% to 100%, with higher scores indicating more absolute differences between patient and physician.

A third variable was calculated which indicates the clinically meaningful difference in expectations scores between patients and physicians. This was done using the scores on the second measure of alignment. The clinical meaningful difference in expectation-scores has found to be ≥ 7[92], which is used as a cut-off point for 'alignment' and 'clinical meaningful differences/non-alignment'.

Besides these three measures, two measures of alignment were calculated on each item-specific expectation. Each expectation of the patient was subtracted from that of the physician [89]. In order to compare patients' and physicians' scores, the items considered "not applicable" by patients was also considered "not applicable" in the physicians' assessment [89]. The resulting scores could range from -5 to +5, with lower scores indicating higher levels of expectations of patients as compared to their physicians. Secondly, scores of -5 to +5 were transformed to absolute values. The

resulting scores could range from 0 to 5, with higher scores indicating more differences between patient and physician.

Alignment of time and origin of non-alignment in expectations

Latent growth curve modelling was used to examine differences in expectations over time (i.e., on T0, T1 and T2), and possible sources of non-alignment (i.e., sex, function, being a hip or knee patient, arthroplasty volume per year and years of experience). Maximum likelihood was used as a method of estimation. Models were fitted in order of complexity. First, we estimated a simple model with only alignment as variable. Second, we estimated the growth parameters (i.e., slope and intercept). The final step was to include the predictors (i.e., arthroplasty volume per year, years of experience, sex, functional status and being a hip or knee patient). We used forward selection in adding predictors to the models, and dropped predictors that did not improve model fit. Relative fit of the models was assessed with the log-likelihood chi-square testing [234].

In addition, several linear regression analyses were conducted, with ordinary least squares as method of estimation, to examine the relationship between the four items assessing the possible sources of information regarding surgery or surgical outcomes, and total absolute alignment scores and direction of disagreement in expectation scores pre-surgery (T2).

RESULTS

Patient characteristics

Demographical characteristics of patients could be found in Table 1. A total of 477 patients were included in this study, with 237 (50%) hip patients (Table 1). Almost three-quarter (73%) of patients expected surgical treatment and received surgical treatment, approximately a quarter of patients received surgical treatment, but did not expect surgical treatment beforehand. Almost all patients indicated that they read the information folder and spoke to patients who already underwent hip or knee replacement. Approximately half of patients attended the educational meeting or

searched for information on the Internet or in books. Hip patients (60%) more often ($\chi 2 = 9.6$, $p \leq .01$) attended the educational information meeting than knee patients (43%).

Physician characteristics

Patients were seen during the medical consultation by a total of 14 physicians and 11 residents. The physician with the lowest volume of arthroplasty surgery performed 31 hip and/or knee surgeries per year, the physician with the highest volume 167 (M = 98.6, SD = 42.5). Residents were classified as having no years of experience. Physicians' years of experience upon completion of education ranged between 5 years and more than 30 years.

Missing values

Of all patients, 15 patients (4.5%) had no outcome expectation score on T0. On T1 and T2, respectively 108 (21.5%) and 154 (30.6%) patients had no outcome expectation score. Missing values at T0, T1 and T2 were not significantly related to age (T0: t = -1.42, $p = .16$; T1: t = 0.03, $p = .97$; T2: t = 0.37, $p = .71$) or being a hip or knee patient (T0: t = 0.73, $p = .46$; T1: t = -1.60, $p = .12$; T2: t = -1.54, $p = .13$). Missing values at T0 and T2 were not related to sex (T0: $\chi 2 = 0.05$, $p = .83$; T2: $\chi 2 = 0.02$, $p = .88$), but were related to sex at T1 (T1: $\chi 2 = 8.9$, $p \leq .01$). More men than women had missing outcome expectation values at T1. Fulfillment of expectations for treatment were not related to missing values at T1 (t = 0.23, $p = .82$) or T2 (t = -0.74, $p = .46$).

Table 1. *Characteristics of hip and knee patients*

	Combined (N=477)	Hip (N=237)	Knee (N=240)	Hip vs. knee	
				t / χ^2	*p*
Women – N (%)	287 (60)	134 (57)	152 (64)	2.5	.12
Age – mean (SD)	69.6 (8.2)	70.4 (8.5)	68.8 (7.9)	2.1	.04
Employed for monetary reimbursement – yes (%)	79 (19.7)	34 (16.8)	45 (24.1)	4.8	.19
Having a partner – yes (%)	325 (79.8)	163 (80)	151 (63.2)	3.7	.59
Weekly engagement in sports – yes (%)	196 (47.9)	97 (47.1)	90 (47.4)	2.4	.66
Treatment expectations fulfilled, yes – N (%)	331 (73.1)	150 (70.4)	164 (74.9)	2.4	.12
Functional disability - mean (SD)	38.6 (13.8)	39.2 (13.8)	38.0 (13.8)	0.8	.43
Did you read the information folder, which was given to you? – yes (%)	326 (95)	168 (97)	146 (94)	2.8	.25
Did you attend the organized educational information meeting regarding your surgery and recovery? – yes (%)	177 (51)	104 (60)	68 (43)	9.6	≤.01
Did you actively search for information on, for example the internet or books, regarding the surgery, recovery or what to expect, yourself? – yes (%)	188 (55)	91 (53)	89 (57)	0.5	.49
Did you spoke to patients who already underwent hip or knee replacement, for example, regarding their experiences? – yes (%)	294 (86)	151 (88)	131 (83)	1.6	.21

Expectations and alignment in expectations

Hip patients and their physicians had higher expectations than knee patients at all time points (Table 2). Expectations between physicians and patients were not aligned in at least 74% of cases (Table 2; Figure 1). Patients and physicians differed at least in one-fifth of cases in amount and level of expectations on T0, T1 and T2 (Figure 1). Scores indicate that patients had higher expectations for outcome of surgery than physicians. Nonetheless, level and direction of disagreement in expectations was the same for hip patient and their physicians and knee patients and their physicians.

Table 2. *Expectations and agreement in expectations of patients and physicians*

% (SD)	Combined	Hip	Knee	Hip vs. knee	
				T / χ^2	*p*
Patients' expectations					
T0 – pre-consultation	67.6 (17.8)	70.5 (17.5)	65.2 (17.6)	2.65	≤.01
T1 – post-consultation	65.1 (21.3)	67.9 (22.1)	62.4 (20.4)	2.51	≤.01
T2 – pre-surgery	72.3 (17.1)	77.1 (15.2)	68.3 (16.9)	4.97	≤.001
Physicians' expectations					
T1 – post-consultation	65.4 (18.6)	68.7 (20.5)	62.3 (16.0)	3.51	≤.001
Agreement					
T0 – pre-consultation	-0.2 (22.8)	0.7 (24.1)	-1.5 (21.4)	0.77	.44
T1 – post-consultation	-0.7 (23.5)	-0.1 (25.4)	-1.5 (21.4)	0.55	.59
T2 – pre-surgery	-8.2 (23.9)	-10.9 (26.0)	-5.9 (21.5)	-1.74	.08
Absolute disagreement					
T0 – pre-consultation	17.5 (14.6)	18.9 (14.9)	16.1 (14.1)	1.56	.12
T1 – post-consultation	18.1 (14.9)	19.6 (16.0)	16.5 (16.6)	1.94	.053
T2 – pre-surgery	19.2 (16.3)	21.0 (18.8)	17.6 (13.6)	1.71	.09
Clinically meaningful disagreement					
T0 – pre-consultation – yes (%)	211 (74.3)	146 (79.3)	138 (70.8)	2.90	.09
T1 – post-consultation – yes (%)	261 (76.1)	127 (75.1)	127 (77.0)	0.15	.70
T2 – pre-surgery – yes (%)	227 (78.3)	109 (77.3)	110 (79.1)	0.14	.71

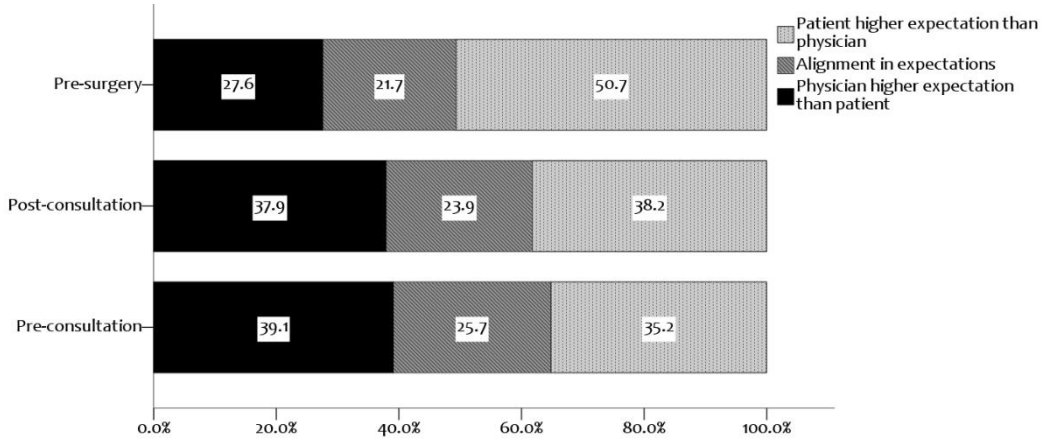

Figure 1. *Agreement and direction of disagreement between physicians' and patients' expectations on T0, T1 and T2.*

The rows display the different time points: pre-consultation (T0), post-consultation (T1), and pre-surgery (T2). Bars are split according to the percentage of agreement among patients' and physicians' expectations (i.e., the dashed dark grey area), the percentage of patients who had higher expectations than their physicians (i.e., the dotted light grey area), and the percentage of physicians who had higher expectations than their patients (i.e., the solid black area).

Item-specific expectations and alignment

Knee and hip patients and their physicians often differed on item-specific expectations on T1 (Figure 2A, Figure 2B), such as sexual activity (89.0% and 86.1%, respectively), the ability to engage in sports (83.8%), and extension of the knee (84.3%). Hip and knee patients and their physicians agreed mostly on expectations for (short) walking (distance) ability (35.8%, and 40.5%, respectively) and (daytime) pain relief (35.5% and 37.7%, respectively).

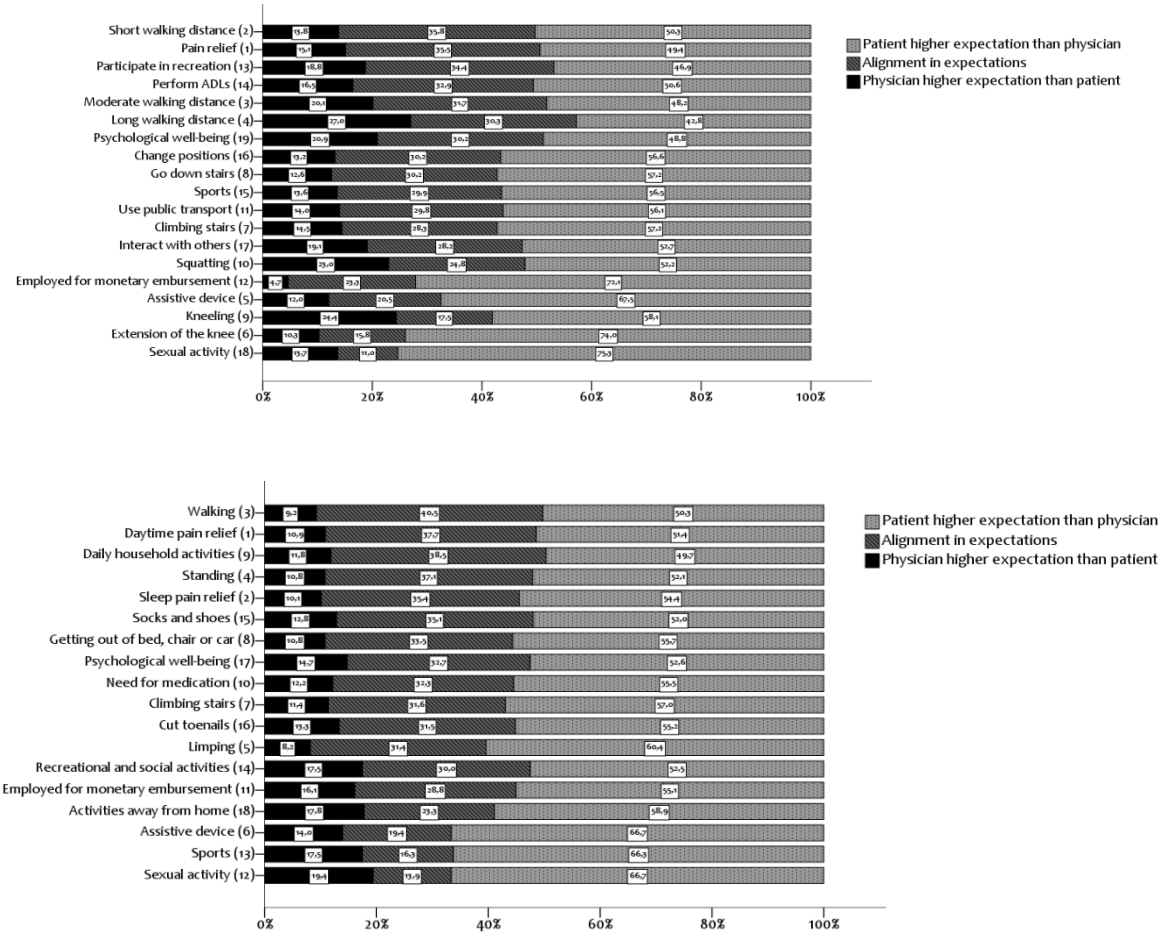

Figure 2A-B. *Agreement and direction of disagreement between physicians and patients on items of HSS-KRES (A) and HSS-HRES (B) on T1.*

The rows display item-specific expectations. Bars are split according to the percentage of agreement among patients' and physicians' expectations (i.e., the dashed dark grey area), the percentage of patients who had higher expectations than their physicians (i.e., the dotted light grey area), and the percentage of physicians who had higher expectations than their patients (i.e., the solid black area).

Alignment over time and origin of non-alignment in expectations

A significant interaction effect was found between time and function in terms of relationship with direction of disagreement ($F(2, 266.2) = 8.9$, $p \leq .001$) (Table 3). The effect of function on the direction of differences between patients' and physicians' expectations differed significantly between T0 and T2 ($t = 4.7$ $p \leq .001$) and T1 and T2 ($t = 6.0$, $p \leq .001$) (Figure 3).

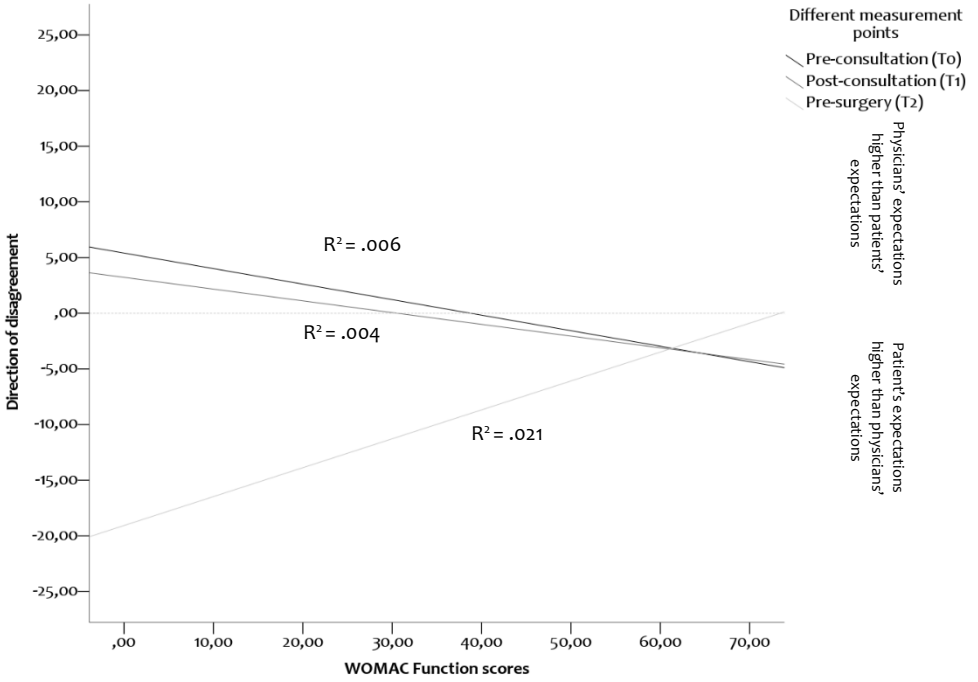

Figure 3. *Relationship between direction of disagreement in expectations and the interaction between time and function.*

The different lines show differences in time between the relationship of functional disability and the direction of disagreement in expectations between patients and physicians. Scores > 0 on y-axis show that physicians have higher expectations than patients. Scores < 0 indicate that patients have higher expectations than physicians.

At T0 and T1, the better the patients' function (i.e., the less functional disability), the greater the likelihood of physicians having higher expectations than patients. However, at T2, the better the patients function, the more likely that patients'

expectations are higher than physicians' expectations. In addition, male patients were more likely to have higher expectations than their physicians ($t = 2.2$, $p = .03$) than female patients ($F(1, 303.2) = 4.8$, $p = .03$) (Table 3, Figure 4).

Absolute non-alignment did not significantly change over time. However, patients' functional disability ($F(1, 302.8) = 10.0$, $p = .002$) was related to alignment between patients' and physicians' expectations. The better patients' function (i.e., lower functional disability), the more disagreement between expectations for outcome between patients and physicians. Furthermore, 'sex' as a predictor did improve model fit, yet there were no significant differences between male and female patients regarding absolute disagreement in expectations ($F(1, 297.0) = 1.28$, $p = .26$).

Information

There were no significant differences between patients who read the information folder, attended the organized educational meeting, actively searched for information or spoke to other patients and patients that did not, in terms of absolute alignment scores in expectations ($r^2 = .02$, $F(4, 278) = 1.7$, $p = .16$), nor in terms of direction of disagreement ($r^2 = .02$, $F(4, 278) = 1.7$, p - .15).

Table 3. *Multilevel analyses examining the origin of disagreement in expectations*

	Direction of disagreement				ABS agreement			
	Df	χ^2	χ^2 change	Likelihood ratio test (*p*)	Df	χ^2	χ^2 change	Likelihood ratio test (*p*)
Model 0: simple model	4	8401.8			4	7598.4		
Model 1: model 0 + random intercept	5	8069.1	332.7	≤.001	5	7419.8		≤.001
Model 2: model 1 + time	8	8024.8	44.3	≤.001	8	7418.2	1.6	n.s.
Model 3: model 2[a] + sex	10	7731.2	293.6	≤.001	7	7156.1	263.7	≤.001
Model 5: model 4 + function	11	6415.8	1315.3	≤.001	10	5954.1	1202.0	≤.001
Model 6: model 5 + time X function	14	6398.5	17.4	≤.001				

Note:

a = 'time' was omitted as predictor in model 3 to 6 of the multilevel analyses of ABS agreement, as it returned non-significant

ABS = absolute

Df = degrees of freedom

N.s. = non-significant

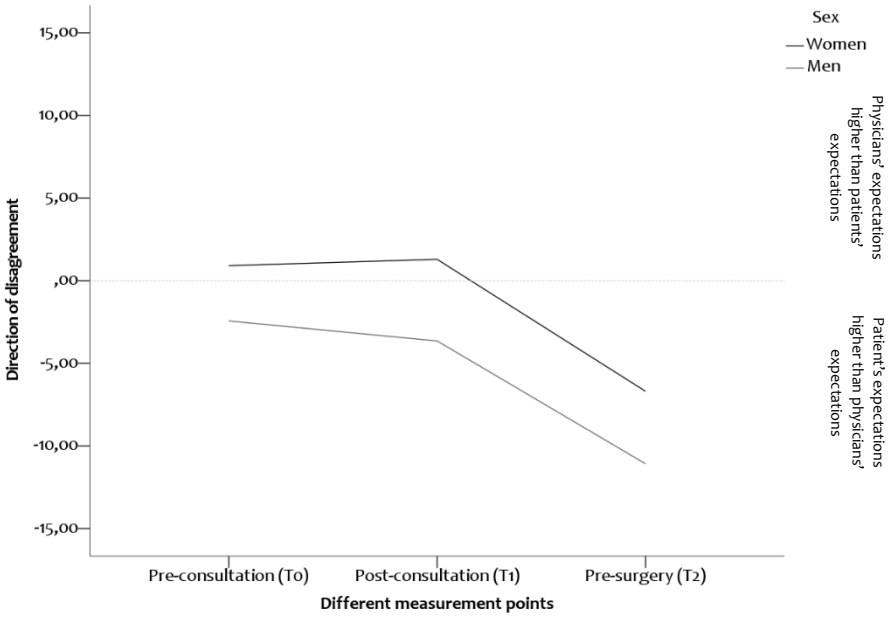

Figure 4. *Relationship between direction of disagreement in expectations and sex.*

The different lines show differences in direction of agreement in male patients and female patients. Scores > 0 on y-axis show that physicians have higher expectations than patients. Scores < 0 indicate that patients have higher expectations than physicians

DISCUSSION

Patients typically have higher expectations than their physicians. In at least 74% of cases, a clinical meaningful difference was found between physicians' and patients' expectations. However, absolute disagreement in expectations did not change over time. Better function (i.e., low functional disability) relates to more disagreement and to patients having lower expectations than physicians, pre-consultation and post-consultation. Yet, better function relates to patients having higher expectations than physicians, pre-surgery. Furthermore, male patients, as compared to female patients, are more likely to have higher expectations than their physicians.

In general, patients had higher expectations than their physicians, which is in accordance with the literature [75,78,224]. In at least 74% of cases, a clinically meaningful difference in expectations between patients and their physicians was found. Areas in which expectations were aligned were mostly related to physical function, as walking, and pain, as earlier findings denoted [89,224,235]. As previously stated, physicians mostly rely on medical criteria for their expectations and might therefore discuss areas of clinical improvement during consultation , resulting in more alignment [224]. However, domains of expectations with the greatest misalignment between patient and physician concern activities which are more demanding and require more advanced movements, like sports, kneeling, and sexual activity. This was previously found [235,236]. Patients often rely on psychological sources for their expectations and might neglect to disclose these expectations partly due to false beliefs about the purpose of the medical consultation, leading to more misalignment in these high demanding domains [99,107-110,224]. Emphasis in practice should therefore be placed on expectations of patients for advanced activities in order to be able to align patients' and physicians' expectations and to prevent patient dissatisfaction following surgery.

Previous findings denoted that information from an experienced physician and educational programs, aimed at making patients' expectations more realistic, resulted in more alignment between patients' and physicians' expectations [39,92,226,228,229,231]. Accordingly, you would expect that agreement on expectations would

improve over time due to the information provided by an (experienced) physician during consultation and several other information sources pre-surgery. Nonetheless, absolute agreement on expectations for outcomes did not change over time in our sample. An explanation for this could be that, for some patients, expectations might not be modifiable, because they already had strong expectations [237]. Moreover, it could be that some patients already had realistic expectations, which align with the information provided [64-69,92]. Alternatively, it could be that physicians are not be aware of patients' high expectations and the misalignment in expectations. In fact, it was found that physicians generally pay little attention to the perceptions of the patient and therefore hardly ask about these expectations [107,108]. High expectations of patients' might therefore not be tempered during consultation. In practice, physicians should therefore examine the patients' perspective during consultation to be able to improve alignment in expectations.

Low functional disability (i.e., better functioning) was related to less absolute alignment. Previously, it was found that patients with high functional disability tend to have high expectations for basal domains as functional improvement and pain relief [51,76-78], while patients low in functional disability generally have higher expectations for complex and advanced tasks or activities [85-87,95,139]. Physicians and patients with high functional disability might align in the expected effect of surgery due to the fact that loss of function and pain are some of the main symptoms of osteoarthritis[3], which are associated with significant improvement [20,238] and high satisfaction [239] after knee or hip replacement. Moreover, physicians and patients with better function might subsequently align less on the expected effects for complex tasks. In practice, physicians should be made aware of the fact that they differ mostly in expectations for outcomes with patients high in function. Physicians should discuss the expectations of patients [52,55,102] both high and low in function, in order to be able to inform them about their different abilities to increase in, for example, function or pain after surgery.

Low functional disability was also related to initial low patient expectations, as compared to physicians' expectations, but higher patient expectations over time. Patients high in function tend to increase their, initial, low expectations pre-surgery. Physicians recommending surgery as treatment option tend to mostly emphasize the pros of surgery [198], thereby possibly unconsciously suggesting that the patients' problems might be resolved after treatment [199], which might increase expectations of patients already high in function. In contrast, patients with high functional disability generally have the highest expectations for outcomes of treatment [81,85-87,90,92,95,97,139], which might be unrealistically high. Physicians usually focus on clinical data [169,170,183] and might in their communication with highly disabled patients focus on the expected effect of surgery on function, thereby lowering these high expectations.

Furthermore, male patients, as compared to female patients, are more likely to have higher expectations than their physicians. Previous findings denote that female patients often have more accordance with their physician [228]. Additionally, male patients often have higher expectations than women [95,240]. Female patients usually talk more openly than male patients who are often more uncommunicative [241]. Hence, this difference in communication style could affect the discussion of expectations during consultation, resulting in male patients retaining higher expectations than female patients, as compared to their physicians.

This study has some limitations. Firstly, up to 31% of patients had a missing expectation sum score. Missing scores were generally not related to age, being a hip or knee patient, sex or fulfillment of expectations for treatment. However, in spite of the ability of multilevel analysis to handle missing data [242], attrition bias could not be ruled out. Secondly, alignment between patients' and physicians' expectations were based on the notion that physicians' expectations will not change over time. Yet, empirical evidence for this notion is lacking. Thirdly, we did not examine physician characteristics other than years of experience and arthroplasty volume, while there could be numerous other factors that could affect physicians' level of expectations.

Therefore, future research should examine physicians' characteristics, as for example optimism, in relationship with level of expectations.

To conclude, it is not known whether it are patients' or physicians' expectations that are realistic and subsequently could predict outcomes after TKA or THA [64-69,92,226,243-245]. Nevertheless, we do know now that patients and physicians usually differ on what to expect for outcomes of surgery and that alignment does not change over time, regardless of information provided by a(n) (experienced) physician or other information sources. Expectations of patients high in functional disability and their physicians are usually aligned, while expectations of less disabled patients and their physicians are usually different. Moreover, male patients often have higher expectations than their physicians as compared to female patients. Physicians should examine the patients' perspective during consultation to be able to improve alignment in expectations. Future research should focus on examining the relationship between patients' and physicians' expectations and patient outcomes, to determine the optimal level of patients' expectations.

PART II

CHAPTER 6

DO DISSATISFIED PATIENTS HAVE UNREALISTIC EXPECTATIONS? A SYSTEMATIC REVIEW AND BEST-EVIDENCE SYNTHESIS IN KNEE AND HIP ARTHROPLASTY

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ABSTRACT

Introduction - End-stage osteoarthritis is commonly treated with joint replacement. Despite high clinical success rates, up to 28% of patients is dissatisfied with the outcome. This best-evidence synthesis aimed to review studies with different forms of study design and methodology that examined the relationship between (fulfillment of) outcome expectations of hip and knee patients and satisfaction with outcome.

Methods - A literature search was performed in PubMed, Web of Science, PsycInfo, Cochrane, and Google Scholar to identify studies conducted up to November 2017. The methodological quality of studies was assessed with the Newcastle-Ottawa Scale.

Results - In this best-evidence synthesis of a systematic review, the following main results could be deducted. Preoperative expectations were in only half of all studies associated with level of satisfaction, while in almost all studies (93%) fulfillment of expectations was related to satisfaction. The effect of met expectations did not differ between patient groups or study design.

Conclusion - Fulfillment of expectations seems to be consistently associated with patient satisfaction with outcome. Emphasis in future research must be placed on the operationalization and measurement of expectations and satisfaction to determine the (strength of the) influence of these different forms of assessment on the (existence of the) relationship. It should thereby be examined what the optimal level of expectations would, or could be, and how changes in (fulfilled) expectations relate to changes in satisfaction. Furthermore, research should be broadened to other patients groups as well to examine the generalizability of these results to 'the patient' in general.

INTRODUCTION

Osteoarthritis (OA) is the most common chronic joint disease, leading to limitations in activities of daily living (ADL) [1-3]. Joint replacement is a commonly used treatment in orthopedics for end-stage OA [19-24]. The risk of complications with joint replacement is usually low and clinical success rates are high [21,22,24]. Up to 90% of patients improve in function after the replacement of the affected joint [20]. However, up to 30% of all patients report some degree of dissatisfaction with the results of the replacement of the knee (i.e. total knee arthroplasty; TKA) or hip (i.e. total hip arthroplasty; THA) [19,38,52,55-57].

Dissatisfaction with the results of surgery could concern, for example, dissatisfaction with improvement in pain or function resulting from medical interventions [46]. Dissatisfaction with these outcomes has been found to result in nonadherence with medication and advice and delayed or insufficient physical improvement [49,50]. This type of dissatisfaction is commonly examined with the reliable and validated self-administered 'Patient Satisfaction Scale' [246], and thereby refers to overall satisfaction with surgery, with pain relief, and with the ability to perform work and recreational activities [81,122,247].

Some studies have indicated that low satisfaction with outcomes of treatment might be related to high preoperative expectations [51,75], as it is found that patients commonly have very optimistic expectations about the results of surgery [51,75,77,78]. Nonetheless, other studies reported no relationship between preoperative expectations and patient satisfaction [75,81,186], and some found that fulfillment of these expectations, rather than expectations itself, could lead to satisfaction [56,77,78,122]. In fact, fulfillment of expectations was the most important factor linked with post-surgery satisfaction in several studies [77,83,122].

Patients' outcome expectations particularly concern a belief or anticipation, that certain actions (i.e., surgery) *will* achieve particular outcomes [61,63,188]. Post-operative fulfilled expectations, however, concern a consideration of whether

surgery *did* achieve particular outcomes, that is, whether expectations have been met[31]. Although these concepts are clearly defined, assessment of these outcome expectations could focus on all different kinds of outcomes, as for example general improvement [38,82,121,126], or more specific, pain level [101,248,249], or functioning [78,248,249]. The Hospital for Special Surgery Hip (Fulfillment) Replacement Expectations Survey (HSS-H(F)RES) [126] or the Hospital for Special Surgery Knee (Fulfillment) Replacement Expectations Survey (HSS-K(F)RES) [86] are questionnaires commonly used [31,77,120,236,247], to assess (fulfilled) expectations in THA and TKA patients, as they examine a broad range of possible outcomes on a continuous scale (i.e. the level of satisfaction) rather than a binary scale (i.e., expectations yes/no).

Based on the literature, it is still not clear whether preoperative expectations or the level of fulfilled expectations is related to patient satisfaction with outcome after surgery. This may be due to differences in methodology. For instance, studies varied in the operationalization (i.e., the precise description of a concept to make it measurable, using, for example, questionnaires) of patients' outcome expectations and satisfaction with outcome. In addition, conflicted findings could have resulted from differences in study design. Specifically, while multiple studies found no relationship between preoperative expectations and satisfaction [124,248,249], when examining it prospectively, one known study reported a relationship between expectations and satisfaction when examining preoperative expectations retrospectively [126]. Differences in study design might explain the relationship between postoperative expectations and satisfaction, as patients' recall of expectations might have changed due to the surgery and recovery [100,222].

Moreover, emphasis in research is predominantly placed on TKA patients instead of THA patients [52,78,122,222]. Yet, satisfaction in THA patients could be low and determined by (fulfillment of) expectations as well [19,23]. Furthermore, few studies examined (differences in) satisfaction and effects of expectations between TKA and THA patients, although there might be a variation in short term and long-term satisfaction between these patient groups. For example, THA patients are often

more satisfied and usually recover faster and to a larger extent than TKA patients [19,23,32], even though change in improvement in function seems to return to the same level for both patient groups after six months[19].

Several previously published systematic reviews did examine the relationship between preoperative expectations and satisfaction in TKA patients [60,188,222,250-252]. Nonetheless, most of the systematic reviews did not include all relevant studies [188,250,252] and they rarely focused on fulfillment of these expectations [60,222,251] or the relationship in THA patients [60,188]. Moreover, only one single systematic review examined the influence of differences in methodology [252]. This study therefore aims to systematically review all studies that have been performed on the relationship between (fulfillment of) expectations and satisfaction with outcome in TKA and THA patients in order to determine what connection (fulfilled) expectations and satisfaction with outcome have in these patient groups. A best-evidence synthesis will be used and recommendations for future research and implications for clinical practice will be made.

METHODS

In accordance with the PRISMA guidelines, this systematic review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on 10-02-2017 (registration number: CRD42017052851).

Search Strategy

An electronic literature search was performed in PubMed, Web of Science, PsycInfo, Cochrane, and Google Scholar to identify eligible studies published in English or Dutch language up to the end of October 2017. Search terms were developed using MeSH terms and consisted of text words related to 1) knee arthroplasty and/or hip arthroplasty, 2) expectations or expectancies, and 3) satisfaction (Table 1). The terms 'expectations' and 'expectancies' are both used in the literature to indicate that someone is 'expecting something for the future'. As Haanstra et al. stated expectancies could be defined as 'the act or state of

expecting' and expectations as 'cognitions regarding probable future events'[188]. Although different concepts, the existing literature was followed and no distinction was made between these two terms.

Eligibility criteria

The search results of all separate databases were combined, after which duplicates were removed (see Figure 1). Titles and abstracts of the remaining articles were screened against the inclusion criteria. Full text articles were assessed when, based on the abstract, they either appeared to meet the inclusion criteria, or when it was unsure whether they met the criteria. Studies were found eligible and were included when meeting the following criteria: 1) the study included TKA and/or THA patients; 2) preoperative outcome expectations and/or postoperative fulfilled outcome expectations were measured; 3) satisfaction with outcome of treatment was measured, 4) the primary or secondary objective of the study was to evaluate the relationship between expectations and satisfaction with outcome of treatment, and 5) data on the relationship between expectations and satisfaction with outcome of treatment in TKA and/or THA patients were available in the study. OA is the most common indication for a total knee- or hip replacement. However, studies with other conditions (e.g., avascular necrosis or rheumatoid arthritis) leading to TKA or THA were also included, as we were interested in the effects of TKA and THA and not of the underlying disease. Studies examining patients with revision TKA or THA were also included, as the aim of the study is not to examine levels of expectations (which could have been different in revision surgery), yet to examine the relationship between expectations and satisfaction.

If studies examined TKA and/or THA patients in combination with other patient groups, yet did not report data on the different patient groups, the study was excluded, as we would otherwise be unable to make a distinction between the differences in patient groups. In line with the aims of our study, we chose to only examine studies, which assessed satisfaction with outcome, and therefore excluded studies examining, for example, satisfaction with care, satisfaction with

received information, and satisfaction with treatment choice. In addition, we chose to only examine studies which assessed outcome expectations, and not, for example, self-efficacy beliefs, or expectations about the process of treatment [63,188]. Even though outcome expectations and satisfaction with outcome could be operationalized in different ways, we chose to include all studies, which examined these concepts, regardless of the operationalization of these concepts.

Table 1

Search strategy for each database

Database	Search terms	Date of search	2nd date of search	3rd date of search
PubMed	((((((((((((("tka") OR "tha") OR "total knee arthroplasty") OR "total hip arthroplasty") OR "hip replacement") OR "knee replacement") OR "tkr") OR "thr") OR "joint replacement") OR "joint prosthesis") OR "knee prosthesis") OR "hip prosthesis")) AND ((("pre operative expectations") OR "post operative expectations") OR "expectations")) AND (("satisfaction") OR "satisfied")	**3-10-2016**	**10-4-2017**	**30-10-2017**
Cochrane library	#1 "TKA":ti,ab,kw or "THA":ti,ab,kw or "total knee arthroplasty":ti,ab,kw or "total hip arthroplasty":ti,ab,kw #2 joint prosthesis:ti,ab,kw or knee prosthesis:ti,ab,kw or hip prosthesis:ti,ab,kw #3 hip replacement:ti,ab,kw or knee replacement:ti,ab,kw or joint replacement:ti,ab,kw #4 expectations:ti,ab,kw or expectancies:ti,ab,kw #5 satisfaction:ti,ab,kw or satisfied:ti,ab,kw #6: #1 or #2 or #3 and #4 and #5	**3-10-2016**	**10-4-2017**	**30-10-2017**
Google Scholar	expectations AND satisfaction THA OR TKA OR "Total knee arthroplasty" OR "total hip arthroplasty" OR "joint prosthesis" OR "knee prosthesis" OR "hip prosthesis" OR "hip replacement" OR "knee replacement" OR "joint replacement"	**3-10-2016**	**10-4-2017**	**30-10-2017**
Web of Science	#1: TS=(tka) OR TS=(tha) OR TS=(total knee arthroplasty) OR TS=(total hip arthroplasty) OR TS=(hip replacement) OR TS=(knee replacement) OR TS=(tkr) OR TS=(thr) OR TS=(joint replacement) OR TS=(joint prosthesis) OR TS=(knee prosthesis) OR TS=(hip prosthesis) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years* #2: TS=(pre operative expectations) OR TS=(post operative expectations) OR TS=(expectations) OR TS=(expectancies) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI Timespan=All years* #3: TS=(satisfaction) OR TS=(satisfied) OR TS=(dissatisfaction) OR TS=(dissatisfied) OR TS=(satisfy*) OR TS=(dissatisfy*) #4: #1 AND #2 AND #3	**3-10-2016**	**10-4-2017**	**30-10-2017**
Psycinfo	AB (tka OR tha OR total knee arthroplasty OR total hip arthroplasty OR hip replacement OR knee replacement OR tkr OR thr OR joint replacement OR joint prosthesis OR knee prosthesis OR hip prosthesis) AND AB (pre operative expectations OR post operative expectations OR expectations OR expectancies) AND AB (satisfaction OR satisfied OR dissatisfaction OR dissatisfied OR satisf* OR dissatisf*	**3-10-2016**	**10-4-2017**	**30-10-2017**

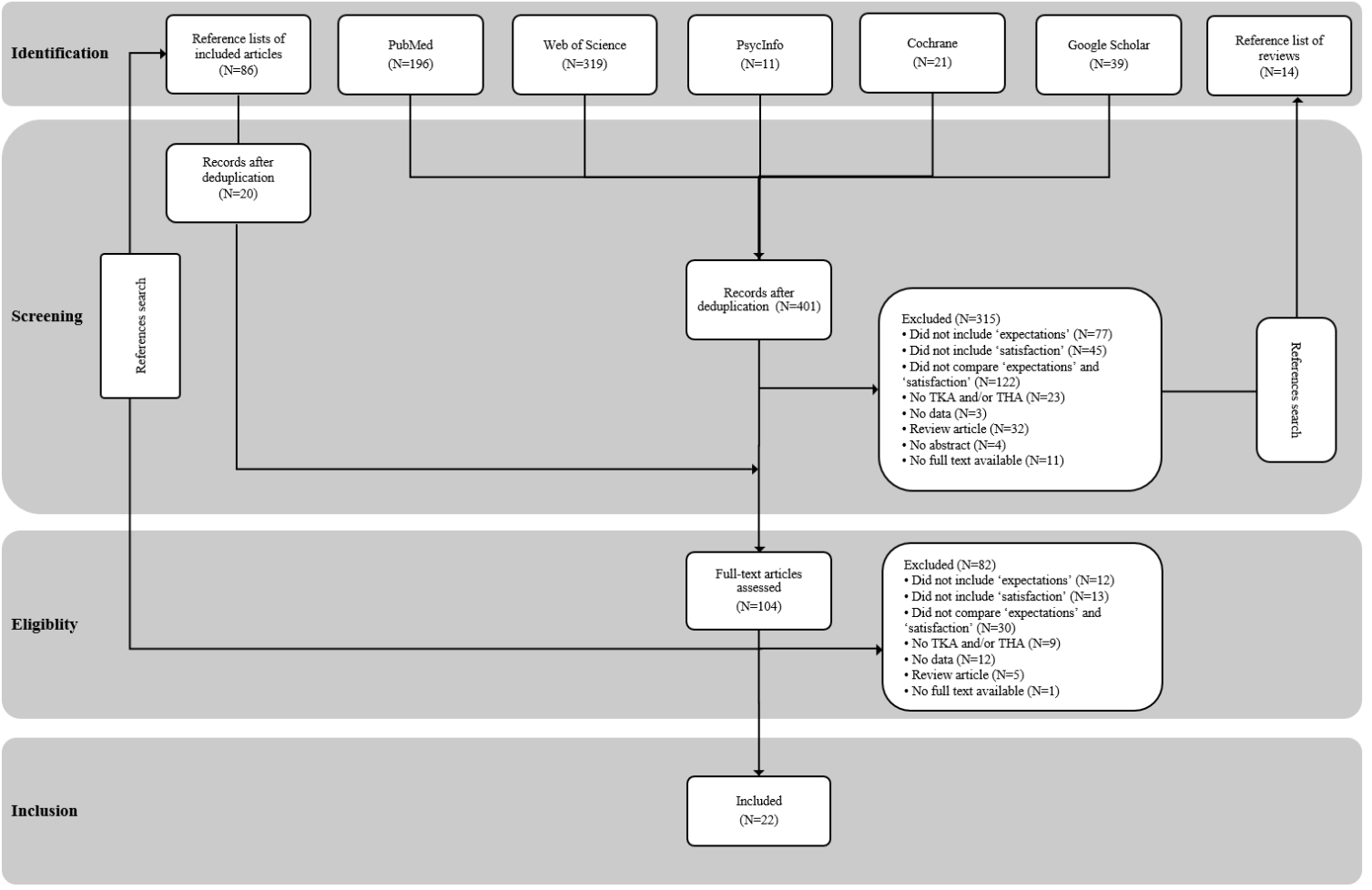

Figure 1. *Flowchart of study selection*

Data extraction

Data were extracted from the included studies using a standardized extraction form (Table 2). If multiple articles have been written on the same dataset, only the most recent study was included. When a study included both TKA and THA patients, a comparison was made between these different patient groups. If no data on the different groups was available, authors were contacted to ask whether they had data on the different subgroups and, if so, to forward it. In addition, comparisons were also made between studies examining preoperative expectations with a retrospective and with a prospective design.

Quality assessment

The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses [253] was used to assess the methodological quality of studies. The NOS assesses studies on three different constructs (selection, comparability and exposure/outcome), with eight questions on which studies could score a maximum of nine points in total. Studies with a score of six or more points on the NOS were regarded as qualitatively good [254]. In order to assure objective assessment, the quality assessment was independently conducted by two researchers. In case of disagreement between reviewers, points of disagreement were discussed in order to reach consensus.

Statistical analysis

A comparison was made between TKA and THA patients in terms of fulfilled expectations and satisfaction. All studies were compared based on average percentages of fulfilled expectations or as percentages of patients who were satisfied, or had all their expectations fulfilled, calculated as a weighted average across all studies examining respectively TKA or THA patients. The number of participants in studies with no separated data on TKA and THA patients were equally split between TKA and THA patients.

Data synthesis

Due to study heterogeneity, it was impossible to synthesize the data in a meta-analysis. An alternative to meta-analysis is the best-evidence synthesis, in which studies are classified based on level of internal and external validity [254]. Studies were identified as 'strong/high-quality' when receiving 6 to 9 points on the NOS. Studies were identified as moderate quality or weak quality when receiving respectively 4 or 5, or 1 to 3 points [254].

Studies were classified as either reporting a significant relationship between (fulfillment of) expectations and satisfaction or as reporting no significant relationship between these concepts based on their own findings and conclusions. Statistical values were, when reported, included in our systematic review. The levels of evidence regarding the significance or non-significance of a relationship among studies were ranked according to the following statements [255]: 1) strong evidence: consistent findings (>75% of the studies reported consistent findings) in multiple high quality studies; 2) moderate evidence: consistent findings (>75% of the studies reported consistent findings) in one high-quality study and two or more moderate quality studies, or in three or more weak quality studies, 3) limited evidence: generally consistent findings (>75% of the studies reported consistent findings) in a high quality study or in two or fewer moderate quality studies, 4) no evidence: no studies could be found, 5) conflicting evidence: conflicting findings.

RESULTS

Study selection process

The search resulted in 586 records. After the removal of 185 duplicates, 401 unique studies were screened (see Figure 1). Based on abstract and title, 315 articles were excluded. The reference lists of included articles and existing relevant reviews were scanned for additional articles. Another 82 articles were excluded after full text assessment, leaving a remaining 22 included articles.

Study characteristics

Twenty (90.9%) cohort studies and two cross-sectional studies [78,126] (9.1%) were included in this review (Table 2). One of the cohort studies was labelled as a cross-sectional study [52], yet this study included multiple follow-up periods with multiple assessments within the same patients, so we considered it a prospective cohort study. Only one study examined revision surgery, instead of primary TKA or THA[101].

Expectations

The operationalization of expectation and satisfaction was quite diverse across studies (see Table 2). However, the majority used the HSS-KRES or HSS-HRES [86,95] or an adaption to this scale (7 studies) or assessed fulfillment of expectations with one single question (6 studies) (Table 2). Others focused on hopes or expectations regarding, for instance, limitations in daily living, pain and walking ability. Some studies examined the number of expectations patients have [75,126], while others assessed the level of patients' expectations [81,124,249], or a combination in relationship with satisfaction [31,72,77,120,236,247]. For example, scores on the HSS-HRES or HSS-KRES represent the combined amount of expectations the patient has and the level of these expectations [86,95]. Studies examining fulfillment of expectations either asked patients how many expectations were fulfilled [31,77,247], or simply examined whether their expectations were fulfilled (yes/no) [31,75,101,120,121,236].

Even though in the majority of studies examining fulfillment of expectations patients were also asked about their preoperative expectations prospectively (9/14), 13 of the 14 fulfillment studies (93%) did not compare preoperative expectations with postoperative fulfillment. Only in one study patients were told what expectations they had cited before and asked how they were now fulfilled [121].

Table 2. *Characteristics of included studies*

Author (year)	TKA/ THA	N	Follow up	Age	Operationalization of expectations	Study design/ Measurement level	% fulfilled	% patients with fulfilled expectations	Operationalization of satisfaction	Measurement level	% satisfied patients
Anakwe, 2011[55]	TKA	850	1yr	68	One question about fulfillment of expectations, n.s.	4 point Likert-scale	n/a	n/a	One question concerning satisfaction with the results of surgery. Additionally: a rating of the pain relief that is achieved, a rating of the success of operation in performance on heavy lifting, the likelihood of recommendation of the operation to a friend, willingness to have operation again, rating of the hospital	4-5 point Likert-scale	93%
Arden, 2011[248]	THA	639	2yr	68	Preoperative questionnaire with questions about: expectations for postoperative pain and limitations in usual activities	Prospective 3-4 point Likert-scale			One question about level of satisfaction with the result of the hip replacement	Binary (satisfied vs. dissatisfied)	92.8%
Bourne, 2011[52]	TKA	1708	1yr	69	Fulfillment of expectations, n.s. Additionally: willingness to have surgery again	n.s.	n/a	n/a	Three questions concerning: satisfaction with the results of the knee replacement, satisfaction with pain reduction, and satisfaction with the ability to perform 5 functions (going up stairs, getting in/out of a car/bus, rising from bed, lying in bed, performing light domestic duties)	5 point Likert-scale	81%

Clement, 2015[120]	TKA	322	1yr	71	Fulfillment of HSS-KRES[86]	5 point Likert-scale	n/a	56%	One question about level of satisfaction with the operated knee	4 point Likert-scale	86%
Eisler, 2002[101]	THA	98	1yr	70	Two questions about fulfillment of expectations with future pain, and walking ability	4 point Likert-scale	n/a	55-69%	A grading of overall satisfaction.	6 point Likert-scale	63%
Gandhi, 2009[124]	TKA THA	1799	1yr	69 -74	Three questions regarding preoperative expectations about: time to fully recover, level of postoperative pain, and ability to perform usual activities	Prospective Responses collapsed into 3 point Likert-scale			One question about level of satisfaction the results of the surgery	Binary (satisfied vs. dissatisfied	93% - 95%
Hamilton, 2013[38]	TKA THA	4709	1yr	70	One questions about fulfillment of expectations, n.s.	6 point Likert-Scale	n/a	n/a	One question with a rating of overall satisfaction with operated hip or knee. Additionally, questions about: pain relieve after surgery, improvement in ability to perform regular activities, performance of heavy work or sport activities, rating of overall hospital experience, willingness to have operation again, the likelihood of recommendation of the operation to a friend.	4-6 point Likert-scale	86.6%
Jain, 2017[247]	THA	207	6 mo	65	Preoperative expectations: HSS-HRES[126]	Prospective 5 point Likert-scale			The Self-Administered Patient Satisfaction Scale [32].	4 point Likert-scale	94.5%
Jain, 2017[247]	TKA	83	1yr	70	Fulfillment of HSS-KRES[86]	5 point Likert-scale	76.7%	n/a	The Self-Administered Patient Satisfaction Scale[32].	4 point Likert-scale	92.3%

Kiran, 2015[249]	TKA	365	2yr	72	Two preoperative questions about expectations with: limitations in usual activities, pain after recovery	Prospective 4 point Likert-scale			One question concerning satisfaction with the result of the knee replacement Additionally, three questions regarding: improvement in overall function, reduction of pain, reduction of pain medication	Binary (satisfied vs. dissatisfied	83.8%
Lim, 2015[121]	TKA	3488	>2yr	67	One question regarding: fulfillment of patient's expectations, n.s.	7 point Likert-scale	n/a	95.6%	Rating of overall results of surgery	6 point Likert-scale	90.5%
	THA			61			n/a	94.9%			91.9%
Lingard, 2006[81]	TKA	525	1yr	69	Four preoperative questions about expectations for: pain level, walking distance, limitation of recreational activity, and use of a walking aid.	Prospective 5 point Likert-scale			The Self-Administered Patient Satisfaction Scale [32]. Additionally, two questions about performance after surgery and willingness to have the same surgery again.	4 point Likert-scale	n/a
Mancuso, 1997[126]	THA	180	2-3yr	65	Two preoperative questions about: expectations of surgery and hopes	Retrospective Open-ended questions			Three questions concerning: willingness to have operation again, meeting expectations, overall satisfaction with the results of hip arthroplasty	Open-ended	89%
Mancuso, 2009[236]	THA	405	6yr	66	Fulfillment of HSS-HRES[126]	5 point Likert-scale	87%	75%	One question: "If you were to spend the rest of your life with your hip symptoms just the way they have been in the last twenty-four hours, how would you feel?"	7 point Likert-scale	94%
Mannion, 2009[75]	TKA	112	2yr	67	Questions concerning fulfillment of expectations about: time to full recovery, pain after recovery, and limitations in everyday activities after recovery.	Open-ended, Likert-scale	n/a	30% / 47%	One question about satisfaction with surgery, n.s.	4 point Likert-scale	90.1%

Noble, 2006[78]	TKA	253	1yr	68	One question about fulfillment of expectation concerning level of activity	Binary (fulfilled vs. not fulfilled)	n/a	n/a	One question about satisfaction with knee replacement	Binary (satisfied vs. dissatisfied	75%
Palazzo, 2014[77]	THA	132	>1yr	64	Fulfillment of HSS-HRES[126]	5 point Likert-scale	73.1%	n/a	One question: "If you were to spend the rest of your life with your hip symptoms just the way they have been in the last twenty-four hours, how would you feel?"	7 point Likert-scale	91.9%
Scott, 2010[122]	TKA	1141	1yr	70	One question about fulfillment of expectations, n.s.	6 point Likert-scale	n/a	n/a	The Self-Administered Patient Satisfaction Scale [32].	4-6 point Likert-scale	81.4%
Scott, 2012[31]	TKA	669	1yr	69	Fulfillment of HSS-KRES[86]	5 point Likert-scale	59%	10%	One question about satisfaction with the operated hip/knee	4 point Likert-scale	78%
	THA			71	Fulfillment of HSS-HRES[126]		72%	21%			88%
De Tejada, 2014[72]	TKA THA	892	1yr	69	Adapted version of HSS-KRES[86] /HSS-HRES[126] (preoperative expectations)	Prospective 5 point Likert-scale			One question: "If you were to spend the rest of your life with your hip symptoms just the way they have been in the last twenty-four hours, how would you feel?"	4 point Likert-scale	n/a
Thambiah, 2015[83]	TKA	103	>1yr	64	Questionnaire assessing preoperative expectations about: improved mobility, reduced pain and better overall quality of life	Prospective n.s.			One question examining overall patient satisfaction. In addition, two questions about recommendations to others and willingness to undergo surgery again.	5 point Likert-scale	92.8%
Vissers, 2010[82]	TKA	44	6 mo	64	Four questions about fulfillment of expectations regarding: pain after surgery, limitations of activities of daily living after surgery, the overall success of the operation and likeliness of having complications	4 point Likert-scale	n/a	n/a	One question about satisfaction with results of surgery	5 point Likert-scale	72.7%

Satisfaction

Satisfaction with outcome was mostly examined with one question assessing overall satisfaction or satisfaction with the results of surgery (11 studies). Four studies asked questions about satisfaction with results of surgery, pain relief, and success of operation in increasing home/yard and recreational activities (i.e., the Patient Satisfaction Scale[246]). Others focused on, for example, likelihood of recommendation of surgery, the willingness to have surgery again and a rating of the hospital as a measure of satisfaction with outcome. Four studies assessed satisfaction with: a rating of the results of surgery [121] or asked patients the question ´"*If you were to spend the rest of your life with your hip symptoms just the way they have been in the last twenty-four hours, how would you feel?*" [72,77,236]. Percentages are reported for the dichotomized proportion of patients that is classified as being satisfied with the results of surgery as compared to the proportion of patients that is classified as being dissatisfied with the results of surgery (Table 2).

Methodical quality

Initially, scores on 12 items (6%) differed between the two reviewers. Disagreement was dissolved by consensus. The mean quality score was 6 out of 9 (range 4-9) (Table 3). A common methodological flaw was the lack of control for important demographic or clinical factors, or other important correlates of satisfaction. Other methodological shortcomings were the lack of description of number of patients who were lost to follow up, or a too large number of patients (i.e. > 20%) lost to follow up, and the absence of a description or operationalization of satisfaction.

Table 3. *Quality assessment with Newcastle-Ottawa Scale*

Author (year)	Selection	Comparability	Outcome	Total	Quality
Anakwe, 2011[12]	• •	• •	• • •	7 / 9	High
Arden, 2011[248]	• •	• •	• • •	7 / 9	High
Bourne, 2011[52]	• •	• •	• • •	7 / 9	High
Clement, 2015[120]	• •	•	• • •	6 / 9	High
Eisler, 2002[101]	• •	•	• • •	6 / 9	High
Gandhi, 2009[124]	• •		• •	4 / 9	Moderate
Hamilton, 2013[10]	• •	• •	• •	6 / 9	High
Jain, 2017[247]	• • •	• •	• • •	8 / 9	High
Jain, 2017[247]	• •	• •	• • •	7 / 9	High
Kiran, 2015[249]	• •	• •	• •	6 / 9	High
Lim, 2015[121]	• •	• •	• •	6 / 9	High
Lingard, 2006[81]	• •	• •	• • •	7 / 9	High
Mancuso, 1997[126]	• •	• •	• •	6 / 9	High
Mancuso, 2009[236]	• •	•	•	4 / 9	Moderate
Mannion, 2009[75]	• •	• •	• •	6 / 9	High
Noble, 2006[78]	• •	• •	• •	6 / 9	High
Palazzo, 2014[77]	• •	• •	• •	6 / 9	High
Scott, 2010[122]	• •	• •	• • •	7 / 9	High
Scott, 2012[31]	• •		• • •	5 / 9	Moderate
De Tejada, 2014[72]	• •	• •	• •	6 / 9	High
Thambiah, 2015[83]	• •	• •	• •	6 / 9	High
Vissers, 2010[82]	• •	• •	• • •	7 / 9	High

Expectations and satisfaction

Overall, 17 out of 22 (77%) studies found a significant positive relationship between preoperative expectations or fulfillment of expectations and satisfaction (Table 4, Figure 2). Moreover, 13 out of the 14 studies assessing *fulfillment* of expectations reported a significant association with satisfaction (93%) (Figure 2). As such, according to our best-evidence synthesis, strong evidence was found that fulfilled expectations were positively related to satisfaction after surgery. Only 4 out of 8 studies examining *preoperative expectations* reported a significant association with satisfaction (50%) (Figure 2). Therefore, according to the guidelines, conflicting evidence was found for a positive link between preoperative expectations and satisfaction.

Difference between TKA and THA patients

Of the 22 included studies, 11 (50%) studies focused on TKA patients, six (27%) on THA patients and five (23%) studies included both TKA and THA patients. Only 2 of these 5 studies reported separate data for TKA and THA patients (Figure 2)[121,122]. For both TKA and THA patients a similar significant positive link between fulfilled expectations and satisfaction existed[121].

Table 4. *Conclusions about relationship between expectations and satisfaction of included studies*

Author (year)	Sig.	Conclusions	Statistics
Anakwe, 2011[12]	Yes	A significant positive correlation between fulfillment of expectations and overall satisfaction	r = .65, p ≤.001
Arden, 2011[248]	No	Pre-operative expectations did not influence level of satisfaction at 12 months or 24 months post-surgery	p = .17 p = .96
Bourne, 2011[52]	Yes	Univariate statistical analysis showed that a significant difference existed between patients with met and unmet expectations in terms of satisfaction	OR = 10.7, p ≤ .001
Clement, 2015[120]	Yes	16 of 17 met expectations were significantly associated with higher satisfaction	OR ≥7.9, p ≤ .08
Eisler, 2002[101]	Yes	Fulfilled expectations about pain and walking ability were moderately positively correlated with satisfaction	r = .47 r = .46
Gandhi, 2009[124]	No	No differences in satisfaction were found between patients with high, moderate of low expectations	p = .92 p = .62 p = .28
Hamilton, 2013[10]	Yes	Meeting patient expectations was significantly positively correlated with higher satisfaction	r = .74, p ≤ .001
Jain, 2017[247]	Yes	Preoperative expectations were positively associated with higher satisfaction at 6 months	b = 0.17, p ≤.001
Jain, 2017[247]	Yes	More fulfillment of expectations is related to higher satisfaction	r^2 = .29, p ≤ .001
Kiran, 2015[249]	No	Pre-operative expectations did not correlate with satisfaction	n/a
Lim, 2015[121]	Yes	At two-year follow-up, met expectations were significantly associated with satisfaction	OR = 105.3, p ≤ .001
Lingard, 2006[81]	No	Satisfaction was not associated with level of preoperative expectations	n/a
Mancuso, 1997[126]	Yes	A strong positive correlation was found between preoperative expectations and satisfaction.	n/a
Mancuso, 2009[236]	Yes	Patients who had a favorable response had a greater proportion of expectations fulfilled (90%) in comparison with those who did not have a favorable response (39%)	p ≤ .001
Mannion, 2009[75]	No	Expectations or met expectations did not contribute to the explained variance in satisfaction	n/a
Noble, 2006[78]	Yes	Met expectations was among 5 other variables, a significant contributor to satisfaction	OR = 6.01, p ≤ .001
Palazzo, 2014[77]	Yes	Fulfillment of expectations was associated with satisfaction	OR = 1.08, p ≤.001
Scott, 2010[122]	Yes	Satisfaction correlated significantly with met expectation	r = .77
Scott, 2012[31]	Yes	A significant difference was found between met expectations in terms of satisfaction in THA patients and TKA patients	p = .003 p ≤.001
De Tejada, 2014[72]	Yes	High and very high expectations of daily activities were associated with a higher level of satisfaction	p = .012 p ≤ .001
Thambiah, 2015[83]	Yes	Pre-operative expectations were significantly associated with higher satisfaction	p = .033
Vissers, 2010[82]	Yes	Fulfilled expectations regarding limitations and overall success of treatment were significantly related to satisfaction (p=≤.001)	OR = 13.6, p ≤ .001 OR = 34.0, p ≤ .001

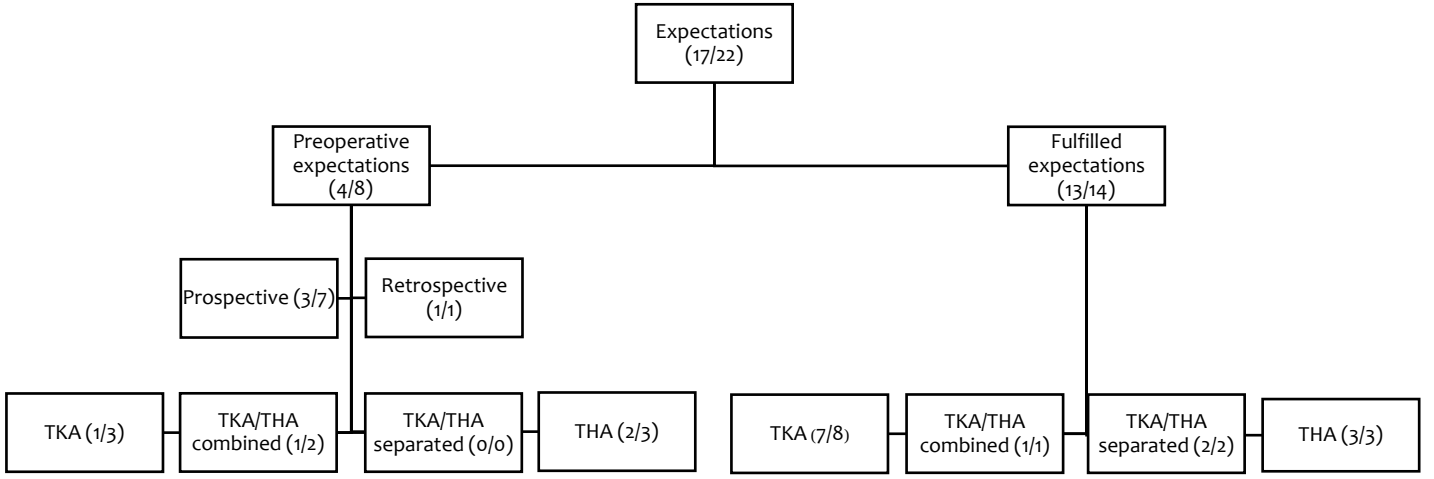

Figure 2. *Schematic representation of methodological characteristics of included studies and number of studies reporting a significant correlation between (fulfillment of) preoperative expectations and satisfaction*

Of the 14 fulfillment studies, 8 (57%) reported values regarding fulfillment of expectations. Almost all hip (81%) and knee (77%) patients had *all* their expectations fulfilled at least 6 months post-surgery. On average, *all* expectations were fulfilled in hip patients in 79%, and in knee patients in 63%. Ninety-one percent of the hip patients was satisfied with the outcome of surgery, while knee patients were satisfied with the outcomes of surgery in 86% of cases.

Retrospective versus prospective designs

Of the 8 preoperative studies, 7 studies (88%) prospectively assessed expectations before surgery. Only 1 study adopted a retrospective design in which patients were asked, after surgery, to recall their preoperative expectations [126].

Three out of seven studies (43%) which prospectively assessed preoperative expectations reported a significant positive association between expectations and satisfaction (Table 4). The one study examining preoperative expectations after surgery (i.e. retrospectively) also reported a significant positive relationship with satisfaction [126]. As such, according to the best-evidence synthesis, conflicting findings are reported as to whether preoperative expectations are related to satisfaction in a prospective design. Moreover, limited evidence existed for the relationship between preoperative expectations and satisfaction in a retrospective design (Figure 3).

Comparing differences in follow-up period

Most studies adopted a follow-up period of approximately 1 year (68%). The significance of the relationship between (fulfillment of) expectations and satisfaction varied largely between different follow-up times and did not point towards a fixed optimal follow-up period (Table 5). Therefore, limited evidence existed for the notion that fulfillment of expectations leads to satisfaction up to 6 months after surgery. However, strong evidence existed for up to 1 year after surgery, conflicting evidence for up to 2 years and strong evidence for up to 6 years.

Table 5. *Percentage of studies with a significant relationship between (fulfilled) expectations and satisfaction found across studies, stratified for follow-up moment*

Relationship		**Yes (percentage)**	**No (percentage)**	**Total (22)**
Up to 6 months		*2 (100%)*	*0 (0%)*	2
	Fulfillment	1 (50%)	0 (0%)	
	Preoperative expectations	1 (50%)	0 (0%)	
Up to 1 year		*10 (80%)*	*2 (20%)*	12
	Fulfillment	9 (100%)	0 (0%)	
	Preoperative expectations	1 (25%)	2 (75%)	
Up to 2 years		*3 (50%)*	*3 (50%)*	6
	Fulfillment	2 (67%)	1 (33%)	
	Preoperative expectations	1 (33%)	2 (67%)	
Up to 6 years		*2 (100%)*	*0 (0%)*	2
	Fulfillment	1 (100%)	0 (0%)	
	Preoperative expectations	1 (100%)	0 (0%)	

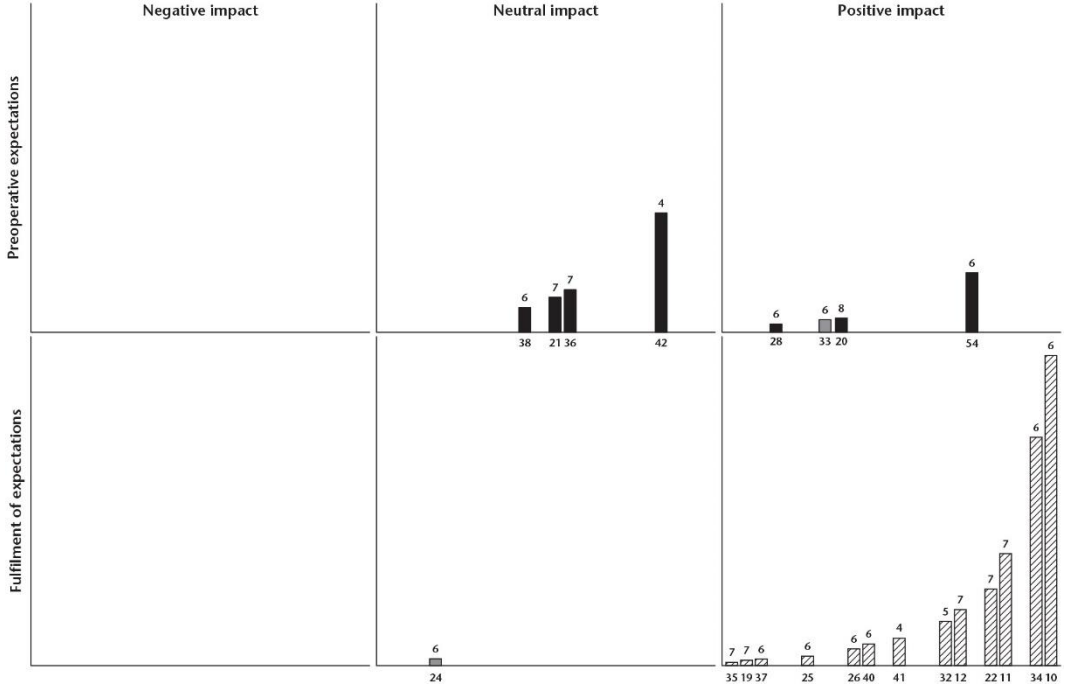

Figure 3. *Harvest plot: evidence for relationship between (fulfillment of) preoperative expectations and satisfaction, stratified by study design.*

Columns represent studies included in this systematic review with their reference number below. The height of columns corresponds to the number of patients examined within that study. Numbers above columns indicate quality of study according to the NOS. Grey shades were used for retrospective studies, black shades for prospective studies. Fulfillment studies are dashed, as they are not classified as either retrospective or prospective. The plot is split between studies examining preoperative expectations and studies examining fulfillment of expectations.

DISCUSSION

This best evidence synthesis provides an overview of the literature regarding the relationship between (fulfillment of) outcome expectations and satisfaction with outcome, and the influence of used methodology and patient group on the (existence of the) relationship. Almost all studies assessing *fulfillment* of expectations reported a significant positive association with either level of satisfaction or the odds of being satisfied with the results of surgery (93%). In contrast, only half of the studies reported a significant relationship between *preoperative* expectations and satisfaction with outcomes of surgery.

One cross-sectional study found that preoperative expectations were generally related to a high level of satisfaction when assessing expectations retrospectively. Nonetheless, they did not state whether either low or high expectations, or having expectations in general, was related to satisfaction [126]. Thereby, it seems that the findings regarding the relationship between preoperative expectations and satisfaction become more conflicted when assessing the relationship prospectively.

Some patients might not be able to recall their preoperative expectations after surgery as the amount of time between the actual expectation and the recall of this expectation, as well as the meaningfulness of the expectation for the patient, determines the accuracy of the recall [256]. Patients may even experience some sort of recall bias or response shift. Due to this possible response shift, patients change their views about expectations to match their present status [100]. In fact, it is found that about 35% of all patients recalled their preoperative function higher as, or lower than, the actual level of functioning [257].

The expectation-confirmation theory states that disconfirmation or dissatisfaction results from a lack of balance between expectations and fulfilled expectations [258], that is, between expectations and fulfilled expectations. Patients might therefore (unconsciously) change their preoperative expectations postoperatively in order to diminish imbalance between expectations and outcomes and to prevent

dissatisfaction. Consequently, both high and low expectations could in essence lead to satisfaction when these expectations are fulfilled [259,260]. However, it can be noted that high expectations have an advantage over low expectations. It was proposed that patients with realistic high expectations might be more motivated to obtain the desired results in rehabilitation by attaining to instructions and training [72], and might actually achieve these results through some sort of self-fulfilling prophecy [73] resulting in fulfilled expectations, leading to a high level of satisfaction. Moreover, as Eisler stated: "*The motivation to undergo surgery reflects its reward value and the expectation of success.*" [101]. It is therefore of great importance to create and maintain high expectations, considering that a delay, or even refusal of surgery may result from low expectations. Nevertheless, unrealistic high expectations (i.e., high expectations which are not in accordance with actual expected outcomes) could in turn lead to dissatisfaction and lower Health Related Quality of Life [123] and, unfortunately, up to half of the patients have too optimistic expectations [75,78].

The contradictory findings from studying only the effect of preoperative expectations on satisfaction were absent when fulfillment of expectations was studied instead. Almost all studies in which the relationship between fulfillment of expectations and satisfaction was examined, found a significant relationship. Only one study told patients what expectations they had cited before and asked how they were now fulfilled [121]. This study was the only study, which found no relationship between fulfillment and satisfaction. Even though it was previously found that a possible response shift could not interfere with the significance of the relationship between fulfilled expectations and satisfaction [250], future research should examine the effects between recalled and actual fulfilled expectations on satisfaction.

Furthermore, no large differences were found in terms of fulfilled expectations or percentage of satisfied patients when differentiating between hip and knee patients. In other studies, THA patients generally met more expectations and were more satisfied with the outcome than TKA patients [32]. It seems that these patients returned to function to a larger and faster extent than TKA patients [19,23,32]. Therefore,

expectations might be met in an earlier stage. Nonetheless, after 6 months, change in improvement in function returned to the same level for both patient groups [19]. The return to the same level of improvement between hip and knee patients, which is found after 6 months, could explain why, in our review, fulfilled expectations and satisfaction are no different between hip and knee patients, as the majority of studies examined fulfilled expectations beyond 6 months post-surgery. However, considering that findings denote that there are differences between hip and knee patients, future research should examine whether the optimal level of expectations differs between hip and knee patients. Furthermore, the results in this review differ largely between follow-up times and do not point towards a fixed optimal follow-up period. As Barlow et al. [250] pointed out, a form of timing bias could exist, as expectations may not be fulfilled up to two years after surgery, considering that function could progress up to two years after surgery.

This study has a number of limitations. The definition of 'satisfaction with outcome' might be a subject of debate since satisfaction is assessed with different instruments in the literature. Moreover, the operationalization of 'outcome expectations' was quite diverse as well. Some studies do not report the method of assessment, while others thoroughly examined several domains of expectations (e.g., expectations regarding symptoms, pain, mobility, quality of life) and satisfaction (e.g., pain, function, hospital experience, and performing regular activities/sport). The lack of consensus on the operationalization of constructs may be a reason for contradictory findings in preoperative studies. Nonetheless, this explanation for contradictory findings seems unlikely, as there were no conflicted findings in fulfillment studies, while they also differed in operationalization of the constructs. The relationship between fulfilled expectations and satisfaction with outcome seems robust, despite differences in measurement and operationalization of the constructs.

Another limitation might be the inclusion of a study with revision surgery [101]. Although the main objective of that study was not to examine level of expectations, findings might be confounded due to prior experiences, which could have influenced the level

of expectations. In addition, only statements regarding the significance of the relationships could be made and not regarding the strength or impact of the relationship, as we were unable to extract effect sizes

Notwithstanding, emphasis in future research should be placed on the operationalization and measurement of expectations and satisfaction to determine the (strength of the) influence of these different forms of assessment on the (existence of the) relationship between (fulfilled) expectations and satisfaction with outcome. It should thereby be examined what the optimal level of expectations would, or could be, and how changes in (fulfilled) expectations relate to changes in satisfaction. Furthermore, research should be broadened to other patients groups as well to examine the generalizability of these results to 'the patient' in general.

In conclusion, fulfillment of expectations is consistently associated with satisfaction regardless of study design or patient group (i.e., hip or knee patients). Summarizing the results of this systematic review, thereby taking into account the existing evidence regarding expectations in TKA and THA patients, it should be noted that patients should have high expectations in order to achieve optimal results, yet should be guarded from unrealistic high or low expectations, as they could lead to unfulfilled expectations and consequently to dissatisfaction.

CHAPTER 7

HIGH PREOPERATIVE EXPECTATIONS PRECEDE BOTH UNFULFILLED EXPECTATIONS AND CLINICAL IMPROVEMENT AFTER TOTAL HIP AND TOTAL KNEE REPLACEMENT

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ABSTRACT

Introduction – Patients' and physicians' expectations regarding treatment effects are thought to be able to impact treatment outcomes. Therefore, this prospective study aimed to examine whether these expectations were related to subjective (i.e., extent of fulfillment of expectations) and/or objective outcomes (i.e., change in pain and function) in both hip and knee patients up to six months post-surgery. Furthermore, we examined if physicians' expectations mediated the relationship between the expectations and outcomes of patients.

Methods – Patients (N = 395) were included at the Department of Orthopedics of the ETZ (Elisabeth-TweeSteden Hospital), the Netherlands. Patients' and physicians' preoperative expectations of outcomes of surgery, and patients' post-operative functional status and extent of fulfillment of expectations were examined. Linear regression analyses were performed to examine the relationships.

Results – High preoperative expectations in hip and knee patients were related to both unfulfilled expectations and to improvement in pain and function. A partial mediation effect of knee patients' preoperative expectations on the relationship between physicians' expectations and change in pain and function was found six months post-surgery.

Conclusion – Patients' high expectations were consistently associated with better objective outcomes. Yet, high expectations in patients were also negatively related to extent of fulfillment of expectations, which indicates that improvement in pain and function was still less than patients expected. Physicians were able to influence patients' expectations. Moreover, by doing this, they were able to change experienced knee patients' outcomes after surgery.

INTRODUCTION

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) are performed in patients with osteoarthritis to relieve pain and improve impaired function [4,18-24]. Outcomes resulting from these surgical interventions are dependent of the genuine effects of treatment [69,70,261]. However, outcomes after surgery that are not attributable to the genuine effect of treatment (e.g., placebo-effects) are common in treatment for conditions with high levels of pain, like osteoarthritis, and can therefore also impact outcomes after THA and TKA [1-3,69,70,261]. These non-specific treatment effects are thought to result from patients believing, or expecting, that particular events will happen to them [69,70].

Patients generally have high expectations for outcomes of THA and TKA [51,75-78]. These expectations could potentially influence these non-specific treatment effects, as they are found to relate to more successful recovery and better general health outcomes [64-70,92]. Patients with high expectations may be more motivated to obtain the desired results in rehabilitation by attaining to instructions and training and might actually achieve these results through a self-fulfilling prophecy [72,73].

However, conflicting findings in the literature are also reported, in which patients' expectations were not significantly related to treatment outcomes. Some studies, therefore, suggested that patients' expectations could mediate the relationship between physicians' expectations and treatment outcomes [67,226,229,261]. Physicians are often seen as experts on what to expect and it is proposed that physicians who communicate their expectations will thereby influence patients' expectations, which will lead to better outcomes [44,225,226,230,244,261-263]. This is in accordance with the notion that expectations are not fixed, they can change during the medical consultation [105,106]. Non-specific treatment effects, like the placebo-effect, in which patients believe in themselves to achieve the desired results, could then be complemented with the physicians' optimism (i.e., the curabo effect) [244]. Consequently, this could relate to advantageous treatment outcomes [244]. If this is true, then physicians could subsequently play an important part in the development and modification of patients'

expectations. However, to the best of our knowledge, no known study examined this mediation effect. Moreover, numerous studies found that physicians' expectations are not always significantly associated with treatment outcomes [67,226,243-245] and significant disagreement among physicians often exist about what to expect [228,232]. For example, physicians generally are worse in predicting outcomes for TKA patients than for THA patients [226,244], who, in general, show less fulfilled expectations, lower improvement rates, longer duration of improvement, and lower level of satisfaction after surgery than THA patients [23,29-33,58].

The literature is inconsistent regarding the relationship between patients' and physicians' expectations and treatment outcomes. Therefore, this prospective study aims to examine the relationship between physicians' expectations and both hip and knee patients' expectations and subjective outcomes (i.e., extent of fulfillment in expectations) and objective outcomes (i.e., change in pain and function) up to six months post-surgery. Six months post-surgery is thought of to be the point in time at which patients, on average, have achieved most clinically important improvement [264,265]. Hip and knee patients' and physicians' expectations will be compared, as outcomes proved different for these two patient groups [23,29-33,58]. Furthermore, a possible mediation effect of patients' expectations on the relationship between physicians' expectations and outcome will be examined.

METHODS

This study is part of the EXPECT-study, a prospective cohort study, examining the relationship between expectations and satisfaction in patients with osteoarthritis. This study is conducted at the Department of Orthopedics of the Elisabeth-TweeSteden Hospital, Tilburg, the Netherlands. Data collection for this paper started in November 2016 and ended May 2019. For this study, only a subset of data was used, namely, only data of patients who received surgical treatment for their osteoarthritis (i.e., TKA or THA patients). This study was conducted according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving

Human Subject Act (WMO) and was approved by the local Medical Ethical Review Board.

Patients

All patients with symptoms of osteoarthritis were consecutively included at first encounter with the physician. Patients were excluded when they were unable to understand or complete the questionnaires (e.g., when having insufficient knowledge of the Dutch language or when suffering from severe cognitive impairment (e.g., dementia)).

Procedure

Patients were referred by their general practitioner to the Department of Orthopedics. At least 48 hours before onset of the medical consultation, patients were identified as eligible and informed about the purpose and content of the study. All included patients were asked to give written informed consent directly upon arrival at the hospital. Patients were asked one week post-consultation (T1) to indicate what their expectations of treatment outcomes were. In addition, physicians were asked to complete the same questionnaire directly after consultation, thereby indicating what their expectations for treatment outcomes for those patients would be. Data from three additional time points were used in this paper: five weeks post-surgery (T2), three months post-surgery (T3), and six months post-surgery (T4). Patients were send questionnaires through post mail or e-mail. Self-addressed envelopes were included to return the completed questionnaires.

Measures

Patients completed the Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES) [126] or the Hospital for Special Surgery Knee Replacement Expectations Survey (HSS-KRES) [86] at T1, the Hospital for Special Surgery Hip Replacement Fulfillment Expectations Survey (HSS-HRFES) [126] or the Hospital for Special Surgery Knee Replacement Fulfillment Expectations Survey (HSS-KRFES) [86] at T2, T3, and T4, and the Hip injury and Osteoarthritis Outcome Score (HOOS) [128] or the

Knee injury and Osteoarthritis Outcome Score (KOOS) [129] at T2, T3, and T4. Physicians completed an adapted version [89] of the HSS-HRES or HSS-KRES, with the modification as follows: "How much relief or improvement seems realistic to you in the following areas as a result of hip/knee replacement surgery for this specific patient?". The items and answer options are identical to that of patients. Moreover, demographics of patients were also collected at T1.

Expectations

The HSS-HRES [126] and the HSS-KRES [86] were used to examine pre-operative expectations. Patients were asked how much improvement they expect in respectively 18 or 19 domains. Answers could range from 0 (*this question does not apply*) to 5 (*complete improvement or back to normal*). The HSS-HRFES [126] and HSS-KRFES [86] consists of the same 18 or 19 domains of expectations. However, patients indicated how much improvement they experienced in these domains. The total score for both questionnaires (i.e. examining pre-operative expectations or experienced outcomes) could range from 0 to respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value could range from 0% to 100%. Values represent the combined amount of expectations the patient has and the level of these expectations. Higher values indicate more and higher level of expectations. For example, a patient with a score of 100% indicated that (s)he expected, or achieved, maximum improvement, in all domains. The Dutch version of this questionnaire showed good test-retest reliability and good internal consistency [127].

Functional status

The HOOS [128] and KOOS [129] were used to assess treatment outcomes. The questionnaires consist of respectively 42 and 40 items, which could be divided into three WOMAC subscales (pain, stiffness and function) [233]. On the HOOS and KOOS, participants had to indicate on a 5-point Likert-scale whether they experienced the problems presented during the last week. Total scores were derived by summing the

answers of each scale. Scores could range from respectively 0-20 (pain), 0-8 (stiffness) and 0-68 (function). Scores were transformed on a scale of 0% to 100%, in which lower scores indicate more extreme problems. The scales have good psychometric properties[128,129]. In this paper, only the subscales pain and function were used.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 24. A 0.05 level of significance was applied to evaluate statistical significance. Total scores for the HSS-HR(F)ES and HSS-KR(F)ES of both patient and physician, and total, and subtotal WOMAC scores for pain and function were calculated for each time point. Changes in WOMAC scores over time were calculated by subtracting baseline scores on T1 from scores on T2, T3 and T4. Scores greater than 0 indicate improvement in pain and function. Scores below 0 indicate a deterioration in pain and function. Moreover, following the analysis of Ghomrawi et al., [226] patients were split based on baseline (T1) WOMAC-scores into tertiles, representing the worst, medium and best WOMAC scores for pain and function. Baseline-adjusted minimal clinical important differences (MCIDs) were calculated for the three tertiles. MCIDs for TKA patients were respectively 45, 28 and 16 for pain, and 45, 33, and 17 for function[226]. Adjusted MCIDs for THA patients were respectively 36, 23, and 15 for pain, and 31, 22, and 9 for function [226]. Fulfilled expectations were calculated by dividing the total score on experienced outcomes (i.e., HSS-HRFES and HSS-HRKES) by the total expectation-score on T1. Values could range from 0% to 100%, with higher values indicating more fulfilled patients' expectations. A value of 100% indicated total fulfilled expectations or outcomes, which even exceeded patients' expectations.

Means and standard deviations (SDs) were calculated for continuous demographic and expectations variables, and frequencies for categorical demographic variables. A number of independent T-tests were conducted to examine differences between hip and knee patients and on demographics, expectations, extent of fulfillment of expectations, function and pain.

A series of linear regression analyses were performed following the steps of Baron and Kenny[266] to examine the relationship between physicians' preoperative expectations and hip and knee patients' change in pain and function, and extent of fulfillment of expectations on T2, T3 and T4, and a possible mediated effect of hip and knee patients' preoperative expectations. Hip and knee patients were regarded as two distinct patient groups, as the ability of physicians to predict outcomes differ between these groups [226,244]. Step 1: regression of change in pain and function and fulfilled expectations on physicians' preoperative expectations, step 2: regression of patients' preoperative expectations on physicians' preoperative expectations, step 3: regression of change in pain and function, and fulfilled expectations on patients' preoperative expectations, step 4: regression of change in pain and function, and fulfilled expectations on physicians' and patients' preoperative expectations. If step 1 to 3 proved significant, zero-order relationships between the variables was assumed. When, in step 4, the effect of patients' preoperative expectations on change in pain and function, and fulfilled expectations remained significant after controlling for physicians' preoperative expectations, mediation was assumed. Partial mediation was supported when the effect of physicians' preoperative expectations on change in pain and function, and fulfilled expectations remained significant when controlling for patients' preoperative expectations. Full mediation was supported when the effect of physicians' preoperative expectations on change in pain and function, and fulfilled expectations diminished when controlling for patients' preoperative expectations.

RESULTS

Patient characteristics

More hip (N = 205; i.e., 52%) than knee patients (N = 190; i.e., 48%) were included in the study (Table 1). Hip and knee patients did not significantly differ on age, sex, employment status, and sports. Mean age was 70 years (± 7.9) and 60% of patients was female. Only 21% of patients was employed for monetary reimbursement and more than half of patients (51%) indicated to engage in sports on a regular basis.

Expectations

On a scale of 0% to 100%, hip patients had a mean score of 69.5% ± 20.4 as expectation score for outcomes of surgery (Table 1). Hip patients had significantly higher expectations than knee patients, who scored, on average, 64.6% ± 18.6 ($t = 2.3$, $p = .03$). Physicians, on average, had a score of 65.3% ± 18.6 as expectations score for outcomes of surgery. A significant difference existed between physicians' expectations for hip and knee patients ($t = 2.7$, $p \leq .01$), in which they expected hip patients (68.3%) to gain more improvement than knee patients (62.2%). Indeed, hip patients generally had more fulfilled expectations 5 weeks post-surgery (respectively 73.0% and 57.1%) ($t = 4.2$, $p \leq .001$), 3 months post-surgery (respectively 87.6% and 77.3%) ($t = 3.2$, $p \leq .01$) and 6 months post-surgery (respectively 90.7% and 82.6%) ($t = 3.3$, $p \leq .001$). Moreover, patients had more expectations fulfilled when time progressed (T2: 65.6%, T3: 82.8%, T4: 87.1%).

Pain

In general, pre-surgery, hip and knee patients (46.4 ± 19.8) reported more pain than persons from a general population[267] (Table 1). Hip patients experienced less pain than knee patients at T2 ($t = 6.7$, $p \leq .001$), T3 ($t = 3.9$, $p \leq .001$) and T4 ($t = 2.6$, $p \leq .01$). Moreover, hip patients (T2: 66%, T3: 76%, T4: 81%) significantly more often had a clinical important difference in improvement in pain than knee patients (T2: 30%, T3: 43%, T4: 45%) at all time points (T2: $t = 5.2$, $p \leq .001$; T3: $t = 4.3$, $p \leq .001$, T4: $t = 5.3$, $p \leq .001$).

Function

Pre-surgery, hip and knee patients seem to experience more limitations in function (44.1 ± 20.4) than persons from a general population [267]. Hip patients experienced more limitations in function than knee patients 5 weeks post-surgery ($t = 2.7$, $p \leq .01$) (Table 1). Nevertheless, no differences were found in limitations in function between hip and knee patients 3 months post-surgery (75.4 ± 15.7) ($t = 1.8$, $p \leq .08$) and 6 months post-surgery (78.6 ±18.3) ($t = 1.8$, $p \leq .07$). However, hip patients (T2: 58%, T3: 78%, T4: 79%) significantly more often had a MCID in improvement in function than

knee patients (T2: 30%, T3: 45%, T4: 57%) at all time points (T2: t = 4.0, $p \leq .001$; T3: t = 4.1, $p \leq .001$, T4: t = 2.8, $p \leq .01$).

Relationship between patients' and physicians' preoperative expectations

Physicians' preoperative expectations were significantly positively related to both hip ($b = .31$, $t(98) = 3.09$, $p = .003$) and knee patients' ($b = .27$, $t(88) = 6.1$, $p = .02$) preoperative expectations.

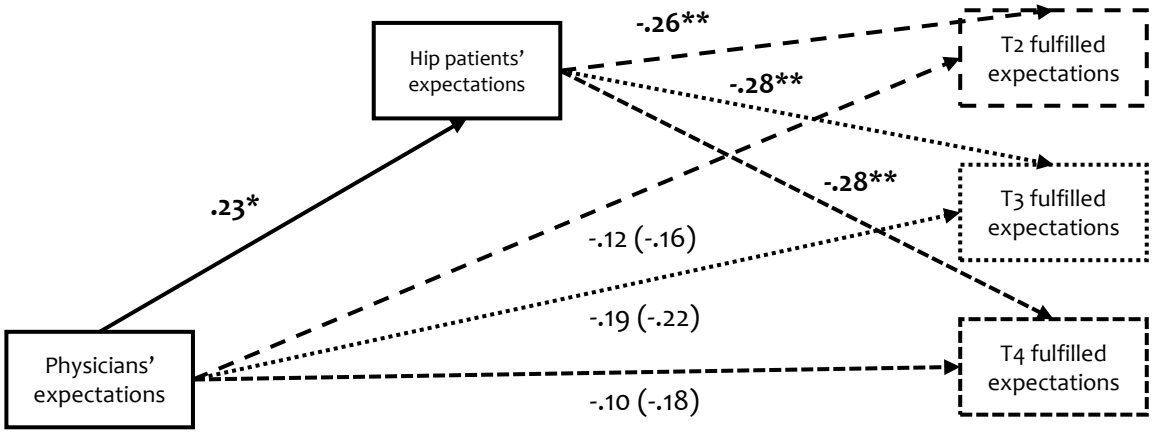
Relationship between preoperative expectations and extent of fulfillment of expectations

Physicians' preoperative expectations were not related to extent of fulfillment of patients' expectations at T2, T3 and T4, in both hip and knee patients (Figure 1). Nonetheless, patients' preoperative expectations were negatively related to the extent of fulfillment of expectations in hip patients at T2 ($b = -.37$, $t(123) = -4.4$, $p \leq .001$), T3 ($b = -.34$, $t(83) = -3.3$, $p = .002$) and T4 ($b = -.33$, $t(124) = -3.9$, $p \leq .001$). Patients preoperative expectations were negatively related to the extent of fulfillment of expectations in knee patients at T2 ($b = -.31$, $t(106) = -3.3$, $p \leq .001$), T3 ($b = -3.2$, $t(71) = -2.9$, $p = .005$) and T4 ($b = -.32$, $t(105) = -2.9$, $p = .004$). No mediation effect of patients' preoperative expectations on the relationship between physicians' expectations and extent of fulfillment of expectations was found.

Table 1. *Characteristics of hip and knee patients*

Mean (SD)	Combined (N=395)	Hip (N=205)	Knee (N=190)	Hip vs. knee	
				t / χ2	*p*
Women – N (%)	236 (59.6)	115 (56.1)	121 (63.7)	5.4	.25
Age	69.8 (7.9)	70.4 (8.0)	69.2 (7.8)	1.4	.15
Employed for monetary reimbursement – Yes (%)	63 (21.2)	32 (19.8)	31 (23.0)	2.1	.56
Conducting sports on regular basis – Yes (%)	153 (50.8)	81 (49.7)	72 (52.2)	4.7	.32
Patients' expectations					
Post-consultation	67.2 (19.7)	69.5 (20.4)	64.6 (18.6)	2.3	.03
Fulfillment of patients' expectations					
5 weeks post-surgery	65.6 (30.1)	73.0 (29.3)	57.1 (28.8)	4.2	≤.001
3 months post-surgery	82.8 (20.7)	87.6 (19.6)	77.3 (20.8)	3.2	≤.01
6 months post-surgery	87.1 (18.1)	90.7 (14.4)	82.9 (21.1)	3.3	≤.001
Physicians' expectations					
Post-consultation	65.3 (18.6)	68.3 (20.5)	62.2 (15.9)	2.7	≤.01
Pain					
Post-consultation	46.4 (19.8)	48.1 (20.7)	44.4 (18.8)	1.4	.17
Tertile 1		≤ 40	≤ 35		
Tertile 2		> 40 | ≤ 55	> 35 | ≤50		
Tertile 3		> 55	> 50		
5 weeks post-surgery	72.4 (21.6)	79.8 (18.5)	64.0 (21.6)	6.7	≤.001
3 months post-surgery	78.9 (18.9)	83.4 (15.7)	73.6 (15.6)	3.9	≤.001
6 months post-surgery	82.6 (18.8)	85.2 (17.1)	79.7 (20.2)	2.6	≤.01
Function					
Post-consultation	44.1 (20.4)	44.1 (20.6)	44.4 (20.2)	0.1	.88
Tertile 1		≤ 33.82	≤ 33.82		
Tertile 2		> 33.82 | ≤ 50	> 33.82 | ≤51.47		
Tertile 3		> 50	≥ 51.47		
5 weeks post-surgery	65.7 (19.4)	69.1 (19.2)	73.4 (20.9)	2.7	≤.01
3 months post-surgery	75.4 (15.7)	77.2 (14.8)	73.1 (16.5)	1.8	.08
6 months post-surgery	78.6 (18.3)	81.0 (16.8)	76.2 (19.6)	1.8	.07
Achieved MCID in pain – Yes (%)					
5 weeks post-surgery	110 (49.5)	80 (66.1)	30 (30.0)	5.2	≤.001
3 months post-surgery	97 (61.4)	67 (76.1)	30 (42.9)	4.3	≤.001
6 months post-surgery	146 (64.6)	100 (80.6)	46 (45.1)	5.3	≤.001
Achieved MCID in function – Yes (%)					
5 weeks post-surgery	74 (44.0)	51 (58.0)	23 (29.9)	4.0	≤.001
3 months post-surgery	95 (64.2)	67 (77.9)	28 (45.2)	4.1	≤.001
6 months post-surgery	136 (68.7)	83 (79.0)	53 (57.0)	2.8	≤.01

Note: MCID = Minimal clinical important difference



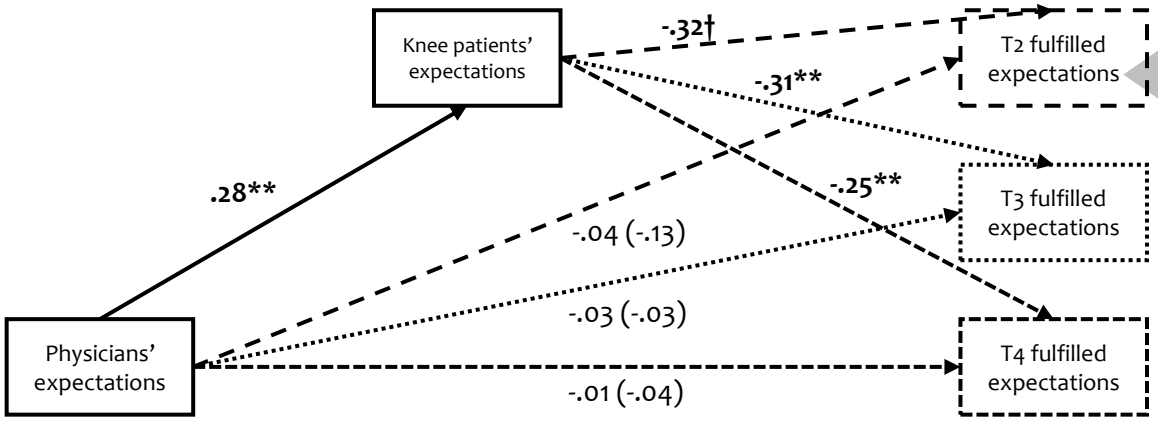


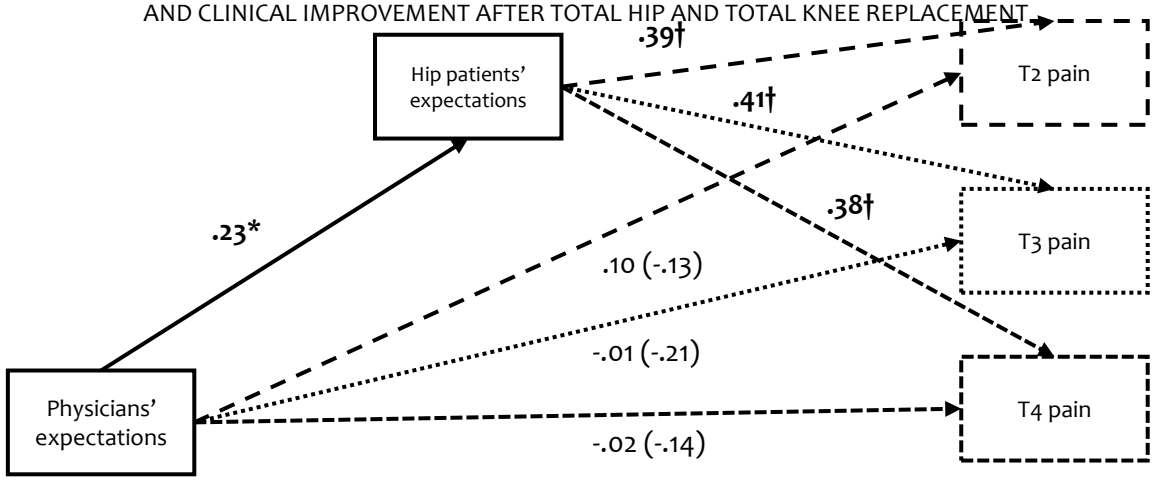
Figure 1a-b. *Standardized regression coefficients for the relationship between physicians' preoperative expectations and hip (a) or knee (b) fulfilled expectations at T2, T3 and T4, mediated by patients' preoperative expectations.*

The standardized regression coefficient for the relationship between physicians' preoperative expectations and fulfilled expectations, controlled for patients' preoperative expectations, is in parentheses. * p ≤ .05, ** p ≤ .01, † p ≤ .001

Relationship between preoperative expectations and pain

Physicians' preoperative expectations were not associated with hip patients' change in pain at T2, T3 and T4 (Figure 2). Yet, physicians' expectations were positively related to improvement in pain from baseline to T4 in knee patients (b = .39, $t(71)$ = 3.6, $p \leq$ .001). Moreover, physicians' expectations were more strongly related to improvement in pain than knee patients' preoperative expectations (b = .22 $t(102)$ = 2.2, p = .03). In hip patients, patients' preoperative expectations were positively correlated with improvement in pain from baseline to T2 (b = .39, $t(120)$ = 4.7, $p \leq .001$), T3 (b = .41, $t(83)$ = 4.0, $p \leq .001$) and T4 (b = .38, $t(125)$ = 4.5, $p \leq .001$).

As physicians' preoperative expectations and knee patients' preoperative expectations were related to improvement in pain at T4, a possible mediated effect via patients' expectations was examined. After controlling for knee patients' expectations, physicians' expectations (b = .36, $t(69)$ = 3.3, $p \leq .001$) remained significantly positive associated with improvement in pain at T4. A Partial mediation effect of patients' preoperative expectations on the relationship between physicians' expectations and change in pain was found.



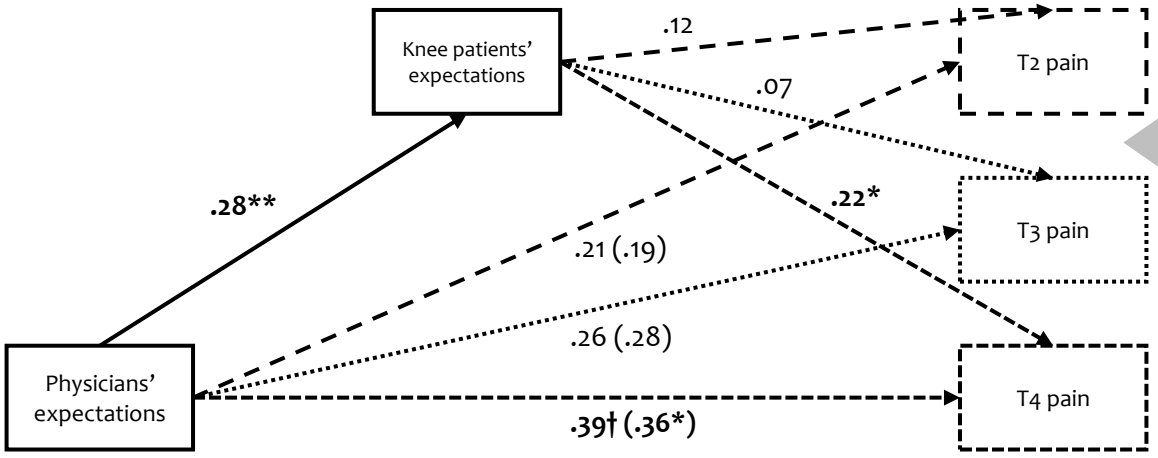


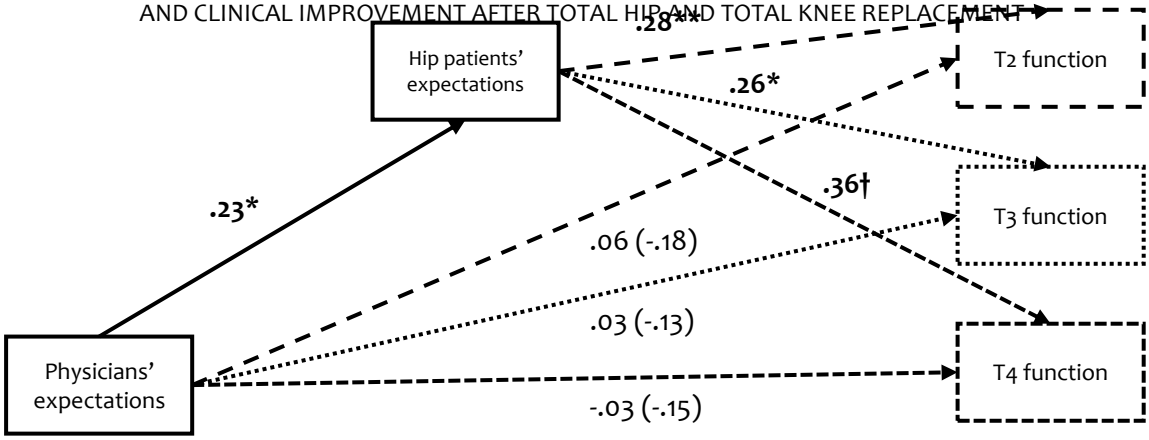
Figure 2a-b. *Standardized regression coefficients for the relationship between physicians' preoperative expectations and hip (a) or knee (b) pain at T2, T3 and T4, mediated by patients' preoperative expectations.*

The standardized regression coefficient for the relationship between physicians' preoperative expectations and pain, controlled for patients' preoperative expectations, is in parentheses. * p ≤ .05, ** p ≤ .01, † p ≤ .001

Relationship between preoperative expectations and function

Physicians' preoperative expectations were not associated to improvement in function from baseline to T2, T3 and T3 in hip patients (Figure 3). Hip patients' preoperative expectations were related to improvement in function at T2 (b = .28, $t(88) = 2.7$, $p \leq .01$), T3 (b = .26, $t(81) = 2.4$, $p = .02$) and T4 (b = .36, $t(106) = 3.9$, $p \leq .001$). Physicians' preoperative expectations were significantly positively related improvement in function at T2 (b = .32, $t(51) = 2.4$, $p = .018$) and T4 (b = .37, $t(63) = 3.2$, $p = .002$) in knee patients. Only improvement in function at T4, and not at T3 or T2, was related to knee patients' preoperative expectations (b = .27, $t(92) = 2.6$, $p \leq .01$). However, physicians' expectations were more highly associated with change in function at T4 than patients' expectations.

As physicians' preoperative expectations and knee patients' preoperative expectations were related to improvement in function at T4, as possible mediated effect via patients' expectations was examined. After controlling for knee patients' expectations (b = .26, $t(60) = 3.0$, $p = .004$), physicians' expectations (b = .35, $t(60) = 3.0$, $p = .004$) remained a significant positive predictor of improvement in function at T4. A partial mediation effect of patients' preoperative expectations on the relationship between physicians' expectations and change in function was found.



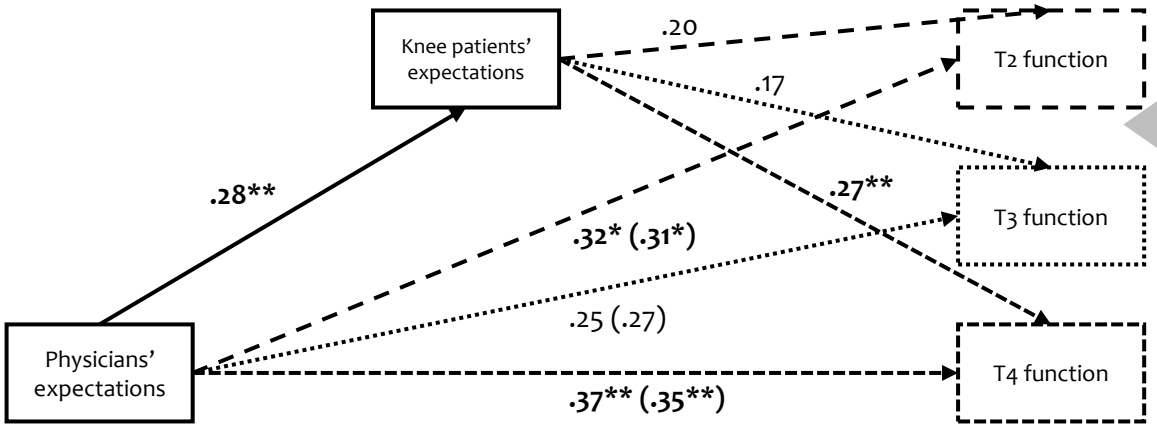


Figure 3a-b. *Standardized regression coefficients for the relationship between physicians' preoperative expectations and hip (a) or knee (b) function at T2, T3 and T4, mediated by patients' preoperative expectations.*

The standardized regression coefficient for the relationship between physicians' preoperative expectations and function, controlled for patients' preoperative expectations, is in parentheses. * p ≤ .05, ** p ≤ .01, † p ≤ .001

DISCUSSION

This prospective study examined whether patients' and physicians' expectations were related to treatment outcomes after TKA and THA. Patients' expectations were positively related to objective outcomes and negatively related to subjective outcomes after TKA and THA. Physicians' expectations were only positively associated with objective improvement in knee patients. A partial mediation effect of knee patients' expectations on the relationship between physicians' expectations and objective outcomes was found, at six months post-surgery. Physicians' expectations positively relate to knee patients' expectations and thereby are able to predict a positive change in function.

As could be expected, patients in our sample had high expectations for outcomes of surgery, which is in accordance with other studies [51,75-78,173,174]. Physicians are, however, more modest in their expectations, as was previously found [54,75,78,89,224,225,235]. Furthermore, hip patients and their physicians had higher expectations than knee patients and their physicians. Knee patients generally obtain less favorable outcomes than hip patients [23,29-33,58]. Indeed, in our sample, hip patients had less fulfilled expectations and experienced less pain than knee patients up to 6 months post-surgery. Additionally, hip patients more often had a MCID in pain improvement than knee patients.

Even though patients generally have higher expectations for treatment outcomes than physicians, physicians' expectations do relate to the amount and level of patients' expectations. Within our study, it was found that the higher the expectations of the physician, the higher the patients' expectations. Moreover, the reversed is also true: the lower the physicians' expectations, the lower patients' expectations. Patients' expectations are thought to, at least partly derive from the interaction with the physician [63,101,103,104]. Physicians can therefore play an important role in refraining too optimistic patients' expectations [92,226,228].

Patients' expectations were both related to objective and subjective outcomes. Regarding objective outcomes, it was found that patients' preoperative expectations were positively related to improvement in pain and function at all time points in hip patients, but only at six months post-surgery in knee patients. Hip patients often show more and faster improvement in function and pain than knee patients [23,29-33,58]. Hip patients' expectations could therefore be related to advantageous outcomes in an earlier stage of recovery than knee patients' expectations. Moreover, preoperative expectations were also related to the extent of fulfillment of expectations, at all time points. However, counterintuitively, given the positive relationship between expectations and pain and function, the association between expectations and the extent of fulfilled expectations was a negative association. The higher patients' preoperative expectations, the less extent of fulfillment of expectations post-surgery. Even though high expectations could relate to improvement in pain and function, expectations of patients are still not met. This indicates that the improvement in pain and function was less than patients expected. This fits the assumption that patients usually have too optimistic expectations, which might not be met, despite the ability of patients' expectations to influence nonspecific treatment effects [51,75-78]. A lack of balance between expectations and fulfilled expectations might then result in dissatisfaction [77,83,122,258].

Physicians' expectations were only associated with objective outcomes in knee patients and not in hip patients in our study. Moreover, a partial mediation effect was found of knee patients' expectations on the relationship between physicians' expectations and improvement in pain and function. In contrast, previous findings showed that physicians often were better in predicting outcomes in THA patients than TKA patients [226,244]. It could be that knee patients as compared to hip patients are more susceptible to the non-specific treatment effect of physicians' expectations (i.e., the curabo-effect [244]) and patients' expectations (i.e., the placebo-effect), so that low expectations of the physician may actually result in low outcomes in knee patients [268,269]. In fact, previous research denoted that the placebo effect was greater when prognosis was worse and expected outcomes were lower [268]. As knee patients

generally obtain lower outcomes than hip patients [23,29-33,58], future research should examine the (difference in) extent of non-specific treatment effects in both hip and knee patients.

A limitation of our study is the fact that we only assessed outcomes reported by patients, and not by physicians. Although patient-reported outcomes have become increasingly important in determining treatment success [38-40], there usually is a large difference between outcomes reported by patients and physicians [44,54,89,225,235]. Future research could therefore examine how physicians' and patients' expectations relate to outcomes reported by physicians (i.e., outcomes from a clinical point of view).

In sum, it was found that patients' high expectations were associated with better objective outcomes. However, high expectations in both hip and knee patients also resulted in unfulfilled expectations, which indicates that improvement in pain and function was still less than patients expected. Physicians' expectations were associated with patients' expectations, and with better outcomes in knee patients. Physicians should, therefore, inform patients what to expect in order to be able to achieve optimal outcomes. In practice, emphasis should particularly be placed at patients with unrealistically high expectations, as a lack of achievable balance between what is expected and achieved could result in dissatisfaction [258]. Moreover, the focus should also be at patients with low expectations, as they might not be motivated to bring the best out of themselves and might therefore be at risk of insufficient recovery [72,73].

CHAPTER 8

THE RELATIONSHIP BETWEEN PERIOPERATIVE FACTORS AND PATIENT SATISFACTION IN TKA AND THA: EXAMINING THE MEDIATING AND MODERATING ROLE OF FULFILLMENT OF EXPECTATIONS

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ABSTRACT

Introduction – Preoperative and postoperative pain, stiffness and function are inconsistently reported to relate to patient satisfaction with outcomes of surgery. Fulfillment of patients' expectations may explain the inconsistencies within the literature. Therefore, this study aims to examine which factors are associated with dissatisfaction with surgical outcomes and whether fulfillment of patients' expectations could mediate or moderate the effects of pain, stiffness and function on satisfaction.

Methods - Patients' (N = 393) preoperative and postoperative pain, stiffness and function, their extent of fulfillment of expectations for outcomes of surgery, and their level of satisfaction with outcomes were examined. Linear regression analyses were performed to examine the relationships.

Results – Significantly more knee patients (24.4%) than hip patients (9.9%) were dissatisfied with the outcomes of surgery ($p = .002$). Less preoperative pain ($p = .02$), stiffness ($p = .009$), and better function ($p = .03$) were related to a higher level of satisfaction. However, the effect was fully mediated by the extent of fulfillment of expectations. A significant interaction effect between postoperative pain ($p = .04$), stiffness ($p \leq .001$), function ($p \leq .001$), and fulfillment of expectations was found. That is, the relationship between postoperative factors and satisfaction diminished when patients' expectations were more fulfilled.

Conclusion - Higher level of preoperative pain and stiffness, and a low level of function relate to less fulfilled expectations and thereby to patient dissatisfaction with outcomes of surgery. Moreover, when the patients' expectations are less fulfilled, the effect of postoperative pain, stiffness and function on satisfaction increases.

INTRODUCTION

In the last 25 years, the number of total knee arthroplasties (TKA) and total hip arthroplasties (THA) performed in the Netherlands has risen from 10,000 to approximately 30,000 per year [25-27]. The prognosis is that this number will further increase with 150% to 300% in the near future [16,25,28]. TKA and THA are commonly performed to treat end-stage osteoarthritis [19-21]. The risk of complications and the number of revision surgery are low and patients generally significantly improve in physical function and pain [21,24,35,36]. As such, TKA and THA are considered to be highly successful treatment options.

In the past, the clinical perspective determined the success of patients' treatment. Nowadays, patient-reported outcomes have become also important in determining success [38,39]. Unfortunately, even though clinical success rates are high, up to one in four patients is dissatisfied with the outcomes of surgery [19,38,56,57]. With the increasing number of arthroplasties performed each year, the absolute number of dissatisfied patients is rising. Consequently, this could result in delayed or insufficient improvement [38,50]. In order to be able to identify patients at risk of dissatisfaction after TKA or THA, and subsequently to prevent patient dissatisfaction, it is important to known how preoperative and postoperative factors relate to satisfaction with outcomes of surgery.

Numerous studies have examined preoperative and postoperative factors related to patient dissatisfaction [31,38,55,72,77,83,118-121,247-249]. Preoperative factors associated with the level of satisfaction with surgical outcome are high levels of pain, stiffness, and low physical function as a result of the osteoarthritis [38,52,122,270,271]. Postoperative determinants of dissatisfaction are persistent postoperative pain, stiffness or little improvement in functional capacity [38,52,55,77,82,83,120,122,247,249]. Yet, evaluating these findings is difficult, as there are also contradicting findings, stating that preoperative factors in general, or more specific physical health factors and symptoms of osteoarthritis do not contribute to patients' level of satisfaction [248,272,273]. In addition,

the findings in the literature are also contradictory regarding the effects of postoperative determinants [249,272].

An explanation for these inconsistencies could be the mediating or moderating effect of expectations. TKA and THA patients usually have high expectations with regard to pain relief, improvement of walking ability, and movement [51,75,77]. Unfortunately, up to 50 percent of these patients have too high expectations, which might be unfulfilled after surgery [75,78]. This could lead to dissatisfaction, as unfulfilled expectations are repeatedly reported as the most important determinant of patient dissatisfaction [31,38,77,83,119-121,247]. Preoperative factors, as high levels of pain, stiffness, and a low level of physical function are both proposed to relate to patient dissatisfaction and are thought to be possible associates of unrealistically high expectations [85,90,92,99,100]. These factors may, therefore, be associated with unfulfilled expectations and as a result be associated with low satisfaction. Fulfilled expectations could then be a mediating factor in the relationship between preoperative factors and satisfaction.

Patients' expectations could also be an explanation for the conflicting findings regarding the relationship between postoperative factors and satisfaction. Some studies found that high expectations could relate to dissatisfaction [72,83,247]. Perhaps, the relationship between postoperative factors and dissatisfaction only holds when, for example, patients expect to be pain free and instead are left with some residual pain. That is, when patients' expectations regarding pain are not fulfilled [31,38,55,77,83,119-121,247]. In contrast, when patients expected to experience some postoperative pain, they might not be dissatisfied, as this might be in line with their expectations.

We expect that both preoperative and postoperative pain, stiffness and function could relate to patient satisfaction, when considering patients' expectations. Therefore, this study aims to determine which factors are associated with dissatisfaction and to examine whether extent of fulfillment of expectations could mediate the effects between preoperative factors and satisfaction and moderate the effect between postoperative factors and satisfaction. A conceptual model of the

expected relationships can be found in Figure 1. Some studies indicated that other non-clinical factors could be associated with patient satisfaction [38,51,52,77,82,122,272]. Therefore, we controlled for the effects of several sociodemographic (i.e., age, gender, socioeconomic status, marital status) factors within our analyses. Moreover, hip and knee patients will be compared, as knee patients are often more dissatisfied than hip patients [31,32,38].

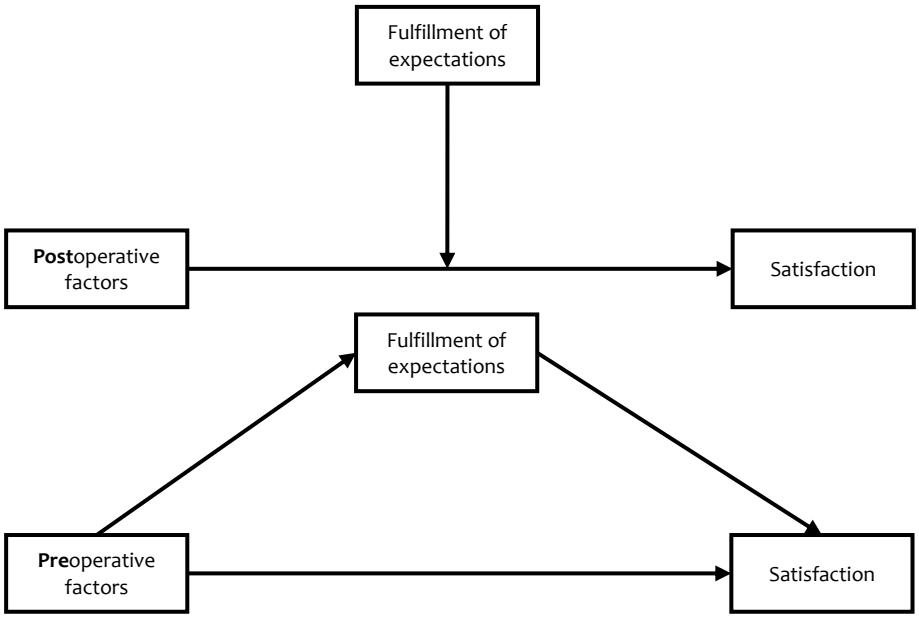


Figure 1. *Conceptual model displaying the proposed relationships between preoperative and postoperative factors, fulfillment of expectations and level of satisfaction in patients.*

METHODS

Data collection for this paper was part of the EXPECT-study, a prospective cohort study examining the relationship between expectations and satisfaction in hip and knee osteoarthritis patients. The study was conducted at the Department of Orthopedics of the ETZ (Elisabeth-TweeSteden Hospital), the Netherlands. Data for this paper were collected between November 2016 and September 2019. The EXPECT-

study was carried out according to the principles of the Declaration of Helsinki (version 8, 2013) and the Medical Research Involving Human Subject Act and was approved by the local Medical Ethics Review Board.

Patients

Patients with symptoms of osteoarthritis were referred by their general practictioner to the Department of Orthopedics. These patients were consecutively included at first medical consultation at the Department of Orthopedics, when they were able to understand and complete the questionnaires (e.g., when having sufficient knowledge of the Dutch language and when not suffering from severe cognitive impairment (e.g., dementia)). Included patients who received no diagnosis of osteoarthritis after medical consultation (i.e., patients whose symptoms were mistakenly reported as symptoms of hip or knee osteoarthritis) were excluded from analysis and the remainder of the study. Only data of patients who received surgery as treatment was used in this paper.

Procedure

Patients were informed about the nature and objectives of the study at least 48 hours before consultation. All included patients gave written informed consent. Patients received a questionnaire one week after consultation (T1) and one year post surgery (T2).

Measures

Demographical and clinical data of patients were collected at T1. Patients completed the Hospital for Special Surgery Hip Replacement Expectations (Fulfillment) Survey (HSS-HR(F)ES) [126] or the Hospital for Special Surgery Knee Replacement (Fulfillment) Expectations Survey (HSS-KR(F)ES) [86] at T1 and T2. With use of the Hip injury and Osteoarthritis Outcome Score (HOOS) [128] or the Knee injury and Osteoarthritis Outcome Score (KOOS) [129] preoperative and postoperative pain, stiffness, and function were assessed at T1 and T2. Satisfaction with outcomes was assessed at T2.

Expectations

The HSS-HRES [126] and the HSS-KRES [86] were developed by Mancuso et al. to assess preoperative expectations. Hip and knee patients were asked how much improvement they expected in respectively 18 or 19 domains. Answers could range from 1 (*I do not have this expectation*) to 5 (*complete improvement or back to normal*) or "this question does not apply" (0). The HSS-HRFES [126] and HSS-KRFES [86] consists of the same 18 or 19 domains of expectations. However, patients were asked how much improvement they experienced in these domains. The total score for both questionnaires (i.e. examining either preoperative expectations or experienced improvement) could range from 0 to respectively 90 or 95, with higher scores representing higher expectations. Scores were transformed by dividing the score of each patient by the maximum score possible on that questionnaire [86,126]. The resulting value represents the combined amount of expectations the patient has and the level of these expectations. For example, a patient with a score of 100% indicated that (s)he expected maximum improvement, in all domains. The Dutch version of this questionnaire showed good test-retest reliability and good internal consistency [127].

Osteoarthritis symptoms

The HOOS [128] and KOOS [129] were used to assess pain, stiffness and functional status. The questionnaires consist of 42 and 40 items, respectively, which could be divided into 3 WOMAC [233] subscales (pain, stiffness, and function). Participants had to indicate on a 5-point Likert-scale whether they experienced the problems presented during the last week. Total scores were derived by summing the answers of each scale. Scores could range from respectively 0-20 (pain), 0-8 (stiffness), and 0-68 (function). Scores were transformed on a scale of 0% to 100%, in which lower scores indicate more extreme problems. The scales have good psychometric properties [128,129].

Satisfaction

Satisfaction was examined with five questions about: satisfaction with the hospital, the results of surgery, pain relief, success of the surgery in increasing home activities, and the success of surgery in increasing recreational activities [246]. Answers could

range from 1 (*very satisfied)* to 5 (*very dissatisfied*). Additionally, patients were asked to rate the likelihood of recommending the surgery and the willingness to have surgery again. Answers could range from 1 (*absolutely)* to 4 (*absolutely not*) and "I am not entirely sure".

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 24. A 0.05 level of significance was applied to evaluate statistical significance. Total scores for the HSS-HR(F)ES and HSS-KR(F)ES and WOMAC scores were calculated for each time point.

Means and standard deviations (SDs) were calculated for continuous demographic, clinical and expectations variables, and frequencies for categorical demographic variables. A number of independent T-tests and chi-square test were conducted to examine differences between hip and knee patients on demographics (e.g., age, sex), expectations, fulfillment, function, stiffness, and pain. In addition, missing values were analyzed.

A measure of fulfillment of expectations was calculated as the difference between preoperative expectations and experienced improvement. The total expectation scores of patients at T2 was divided by their preoperative expectations (T1). Values could range from 0% to 100% and beyond, with higher values indicating more fulfilled patients' expectations. A value of 100% indicated total fulfilled expectations. A value above 100% indicated outcomes that even exceeded patients' expectations.

Scores on the seven satisfaction items were transformed to a scale of 0 to 100 with increments of 25, in which 0 = *very dissatisfied/absolutely not,* 50 = *I am not entirely sure/neutral* and 100 = *very satisfied/absolutely*. A total satisfaction score was calculated as the mean score of the seven satisfaction questions. Scores could range from 0 (*totally dissatisfied*) to a maximum total score of 100 (*highly satisfied*). A second variable was calculated to examine the percentage of satisfied patients versus

dissatisfied patients, by merging all scores from 0 to 50 into one group (representing the dissatisfied group), and all scores higher than 50 into another group (representing the satisfied group)

Several linear regression analyses were conducted, with ordinary least squares as method of estimation, to examine the relationship between the preoperative and postoperative factors and level of satisfaction one year post TKA or THA. A possible interaction between the effect of postoperative factors and fulfilled expectations on satisfaction was examined.

Post-hoc analyses were performed in which a possible mediation effect of fulfilled expectations on the relationship between preoperative factors and satisfaction is examined one year post surgery. A series of linear regression analyses were performed for each mediation following the steps of Baron and Kenny [266]. Step 1: regression of satisfaction on preoperative factors, step 2: regression of satisfaction on fulfilled expectations, step 3: regression of preoperative factors on fulfilled expectations, step 4: regression of satisfaction on preoperative factors and fulfilled expectations. If step 1 to 3 proved significant, zero-order relationships between the variables may be assumed. When, in step 4, the effect of preoperative factors on satisfaction remained significant after controlling for fulfilled expectations, mediation was assumed. Partial mediation was supported when the effect of preoperative factors on satisfaction remained significant when controlling for fulfilled expectations. Full mediation was supported when the effect of preoperative factors on satisfaction diminished when controlling for fulfilled expectations.

RESULTS

More than four-fifth of surgery patients (N = 338, 82%) returned their questionnaire pre-consultation. One year post-surgery, 65% of patients (N = 268) returned their questionnaire. Missing values at T1 and T2 were not related to age of participants (T1: $t = -0.6$, $p = .52$, T2: $t = -0.4$, $p = .67$) or being a hip or knee patient (T1: $\chi 2 = 0.1$, $p = .74$,

T2: $\chi 2 = 0.1$, $p = .85$). More women than men had missing values at T1 ($\chi 2 = 4.9$, $p = .03$). However, at T2 no differences between percentage of missing values was found between male and female patients ($\chi 2 = 0.1$, $p = .75$).

Patient characteristics

Hip (N = 210) and knee patients (N = 201) did not significantly differ on age, sex, employment status, marital status, and education level (Table 1). Mean age was 70 years (SD = 8.1) and 60% of the patients was female. Of all patients, 78.1% was married and 18.1% of patients was employed for monetary reimbursement. About half of all patients (51%) indicated secondary education as highest level of education.

Expectations

On a scale of 0% to 100%, hip patients scored 69.1% (SD = 20.8) as score for expectations for outcomes of surgery at T1 (Table 1). Knee patients had significantly lower and less expectations than hip patients (i.e., 62.9% ± 19.0) ($t = 2.8$, $p = .005$). On average, 86.3% of patients' expectations were fulfilled one year post-surgery. No significant differences were found between hip and knee patients.

Osteoarthritis symptoms

Pre-surgery, patients scored 46.2 (SD = 20.0) as average score on pain pre-surgery on a scale ranging from 0 (worst pain) to 100 (no pain at all) (Table 1). Their pain scores diminished to an average score of 87.6 (SD = 14.8) for hip patients and a score of 81.9 (SD = 19.8) for knee patients. Knee patients reported significantly more residual pain at one year post-surgery compared to hip patients ($t = 2.6$, $p = .009$).

Pre-surgery, patients scored 43.9 (SD = 20.2) as average score on function on a scale ranging from 0 (worst functional disability) to 100 (no functional disability at all). Their function scores diminished to an average score of 81.5 ± 17.9. No significant differences were found between hip and knee patients.

Pre-surgery, hip patients scored 32.5 (SD = 23.7) as average score on stiffness pre-surgery on a scale ranging from 0 (worst pain) to 100 (no pain at all). Knee patients reported significantly less stiffness (μ = 38.8, SD = 21.8) than hip patients did (t = 1.6, *p* = .01). Hip and knee patients' stiffness scores diminished to an average score of 78.0 (SD = 22.8) for hip patients and a score of 67.3 (SD = 26.7) for knee patients. Knee patients reported significantly more residual stiffness at one year post-surgery than hip patients did (t = 3.5, *p* = .001).

Satisfaction

Overall, knee patients were significantly less satisfied (μ = 68.8, SD = 23.5) than hip patients (μ = 77.2, SD = 20.9) at T2 (t = 2.9, *p* = .004) (Table 1). More knee patients (i.e., 24.4%, N = 29) than hip patients (i.e., 9.9%, N = 11) indicated to be dissatisfied with the outcomes of surgery (t = 9.7, *p* = .002). Patients were mostly satisfied with the hospital experience and least satisfied with the ability to do sports or recreational activities (Table 1).

Table 1. *Patient sociodemographic and clinical characteristics, (fulfillment of) expectations and satisfaction*

Mean (SD)	Combined (N=393)	Hip (N=199)	Knee (N=194)	Hip vs. knee	
				t / χ2	*p*
Women – N (%)	236 (60.1)	112 (56.3)	124 (63.9)	2.4	.12
Age	69.8 (8.1)	70.6 (8.4)	69.1 (7.7)	1.9	.053
Employed for monetary reimbursement – Yes (%)	63 (18.1)	26 (14.2)	37 (22.3)	4.7	.10
Married – Yes (%)	274 (78.1)	139 (76.0)	135 (80.4)	4.1	.54
Education – N (%)					
Primary education	53 (15.5)	33 (18.4)	20 (12.2)	2.4	.12
Secondary education	175 (51.0)	84 (46.9)	91 (55.5)		
Tertiary education	115 (33.5)	62 (34.6)	53 (32.3)		
Patients' expectations (T1)	66.1 (20.2)	69.1 (20.8)	62.9 (19.0)	2.8	.005
Experienced improvement (T2)	66.5 (20.8)	71.8 (19.8)	61.0 (20.6)	4.4	.001
Fulfillment of patients' expectations	86.3 (19.3)	88.4 (17.3)	84.2 (21.0)	1.6	.10
Satisfaction					
Overall level of satisfaction	73.0 (22.6)	77.3 (20.9)	68.8 (23.5)	2.9	.004
Results of surgery	80.3 (24.5)	84.1 (22.8)	76.3 (25.5)	2.6	.009
Hospital experience	81.1 (22.6)	82.1 (21.8)	80.0 (23.4)	0.8	.45
Willingness to have surgery again	80.1 (29.5)	84.9 (26.3)	75.2 (31.8)	2.6	.009
Likelihood of recommending the surgery	82.3 (28.0)	88.8 (21.9)	75.8 (31.9)	3.9	.001
Pain relief	71.7 (28.3)	76.5 (25.9)	66.9 (29.9)	2.8	.006
Ability to do home or yard work	66.1 (29.4)	71.8 (28.3)	60.4 (29.5)	3.2	.001
Ability to do sports or recreational activities	50.2 (31.4)	54.7 (32.2)	45.7 (30.0)	2.3	.02
Satisfied – N (%)	198 (83.2)	108 (90.8)	90 (75.6)	9.7	.002
Results of surgery	241 (91.3)	125 (93.3)	116 (89.2)	1.4	.24
Hospital experience	254 (96.2)	130 (97.0)	124 (95.4)	.48	.49
Willingness to have surgery again	226 (90.0)	117 (92.9)	109 (87.2)	2.2	.14
Likelihood of recommending the surgery	238 (90.8)	126 (95.5)	112 (86.2)	6.8	.009
Pain relief	225 (86.2)	118 (90.1)	107 (82.3)	3.3	.07
Ability to do home or yard work	214 (80.8)	114 (85.7)	100 (75.8)	4.2	.04
Ability to do sports or recreational activities	162 (63.3)	86 (67.7)	76 (58.9)	2.1	.14
Pain					
1 week pre-surgery	46.2 (20.0)	46.4 (21.2)	45.9 (18.7)	0.2	.83
12 months post-surgery	84.8 (17.6)	87.6 (14.8)	81.9 (19.8)	2.6	.009
Function					
1 week pre-surgery	43.9 (20.2)	42.9 (20.7)	45.1 (19.6)	-1.0	.34
12 months post-surgery	81.5 (17.9)	83.3 (16.3)	79.6 (19.3)	1.6	.11
Stiffness					
1 week pre-surgery	35.5 (23.0)	32.5 (23.7)	38.8 (21.8)	-2.6	.01
12 months post-surgery	72.7 (25.3)	78.0 (22.8)	67.3 (26.7)	3.5	.001

Relationship between preoperative factors and satisfaction

Less preoperative pain (r^2 = .10, *b* = 0.30, *t*(214) = 4.4, *p* ≤ .001), stiffness (r^2 = .12, *b* = 0.34, *t*(215) = 5.0, *p* ≤ .001), and better function (r^2 = .12, *b* = 0.33, *t*(196) = 4.7, *p* ≤ .001) were significantly related to more fulfillment of expectations (Figure 2). In addition, a higher extent of fulfillment of expectations was related to a higher level of satisfaction at T2 (r^2 = .14, *b* = 0.30, *t*(189) = 4.4, *p* ≤ .001). Furthermore, less preoperative pain (r^2 = .07, *b* = 0.17, *t*(194) = 2.3, *p* = .02), stiffness (r^2 = .08, *b* = 0.19, *t*(197) = 2.7, *p* = .009), and better function (r^2 = .08, *b* = 0.17, *t*(181) = 2.2, *p* = .03) were also related to a higher level of satisfaction at T2 (Figure 2).

As preoperative factors and fulfillment of expectations were related to level of satisfaction, a possible mediation effect via fulfillment of expectations was examined. After controlling for fulfillment of expectations, preoperative pain (r^2 = .15, *b* = .11, *t*(186) = 1.4, *p* = .17), stiffness (r^2 = .15, *b* = .12, *t*(187) = 1.6, *p* = .11), and function (r^2 = .16, *b* = .11, *t*(171) = 1.4, *p* = .16) were no more significantly associated with level of satisfaction (Figure 2). Full mediation of the extent of fulfillment of expectations on the relationship between preoperative pain, stiffness, and function and level of satisfaction was supported.

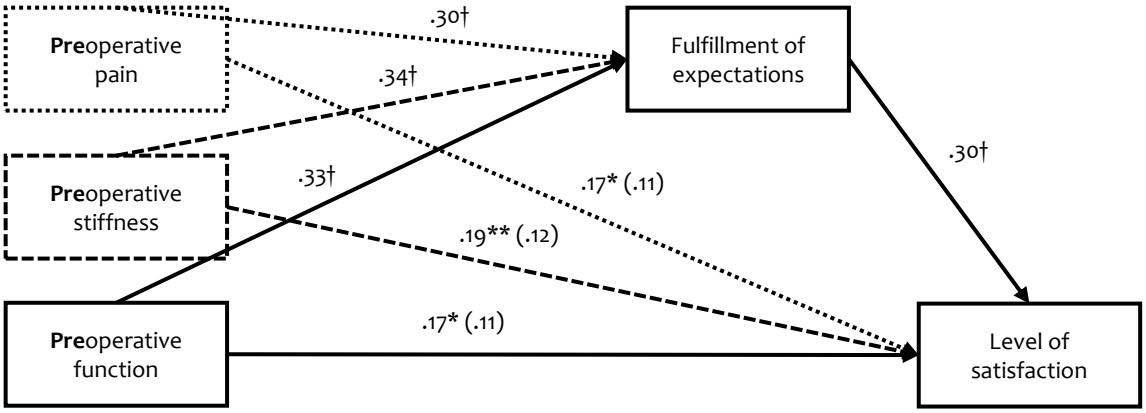


Figure 2. *Standardized regression coefficients for the relationship between preoperative pain, stiffness, and function and level of satisfaction one year post-surgery, mediated by extent of fulfillment of expectations.*

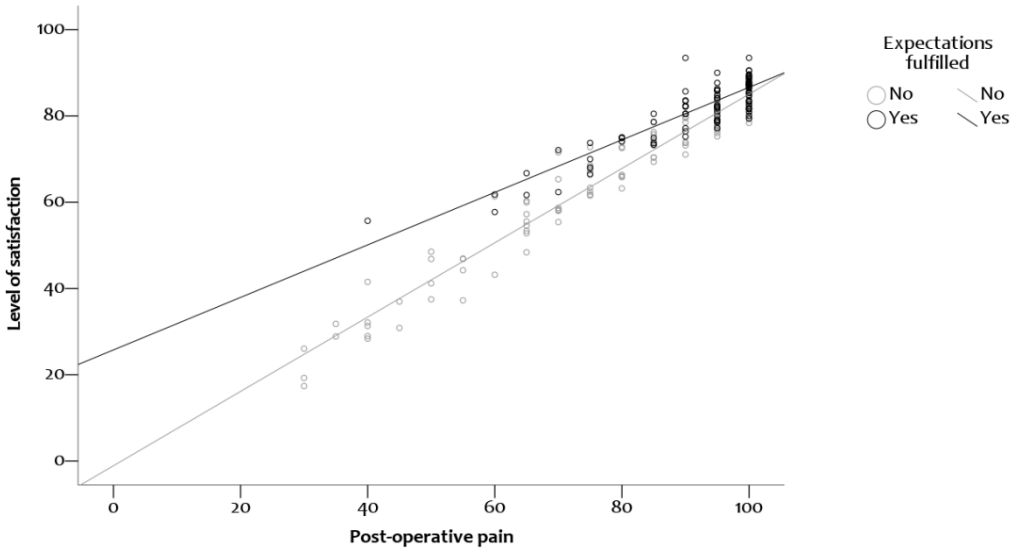
The standardized regression coefficients for the relationship between preoperative factors and level of satisfaction, controlled for patients' fulfillment of expectations, is in parentheses. * $p \leq .05$, ** $p \leq .01$, † $p \leq .001$

Moreover, being a hip or knee patient contributed significantly in explaining the variance in level of satisfaction at T2 when controlling for extent of fulfillment of expectations and preoperative pain ($t = -3.0$, $p = .003$), stiffness ($t = -3.2$, $p = .002$), and function ($t = -3.3$, $p \leq .001$). So, knee patients were significantly less satisfied than hip patients. Marital status, level of education, age and sex did not significantly relate to level of satisfaction.

Relationship between postoperative factors and satisfaction

A significant interaction effect between postoperative pain ($r^2 = .48$, $b = -.18$, $t(182) = -2.02$, $p = .04$), stiffness ($r^2 = .52$, $b = -.42$, $t(187) = -4.1$, $p \leq .001$), and function ($r^2 = .58$, $b = -.31$, $t(173) = -3.5$, $p \leq .001$) on the one hand, and fulfillment of expectations on the other hand, in the relationship with level of satisfaction, was found. Thus, postoperative residual pain, stiffness, and low level of function were related to a lower level of satisfaction. However, this relationship diminished when patients' expectations were more fulfilled (Figure 3).

Being a hip or knee patient contributed significantly in explaining the variance in level of satisfaction at T2 when controlling for extent of fulfillment of expectations and postoperative pain (t = -2.2, *p* = .03) and function (t = -2.6, *p* = .01). So, knee patients were significantly less satisfied than hip patients. Marital status, level of education, age and sex did not significantly relate to level of satisfaction.



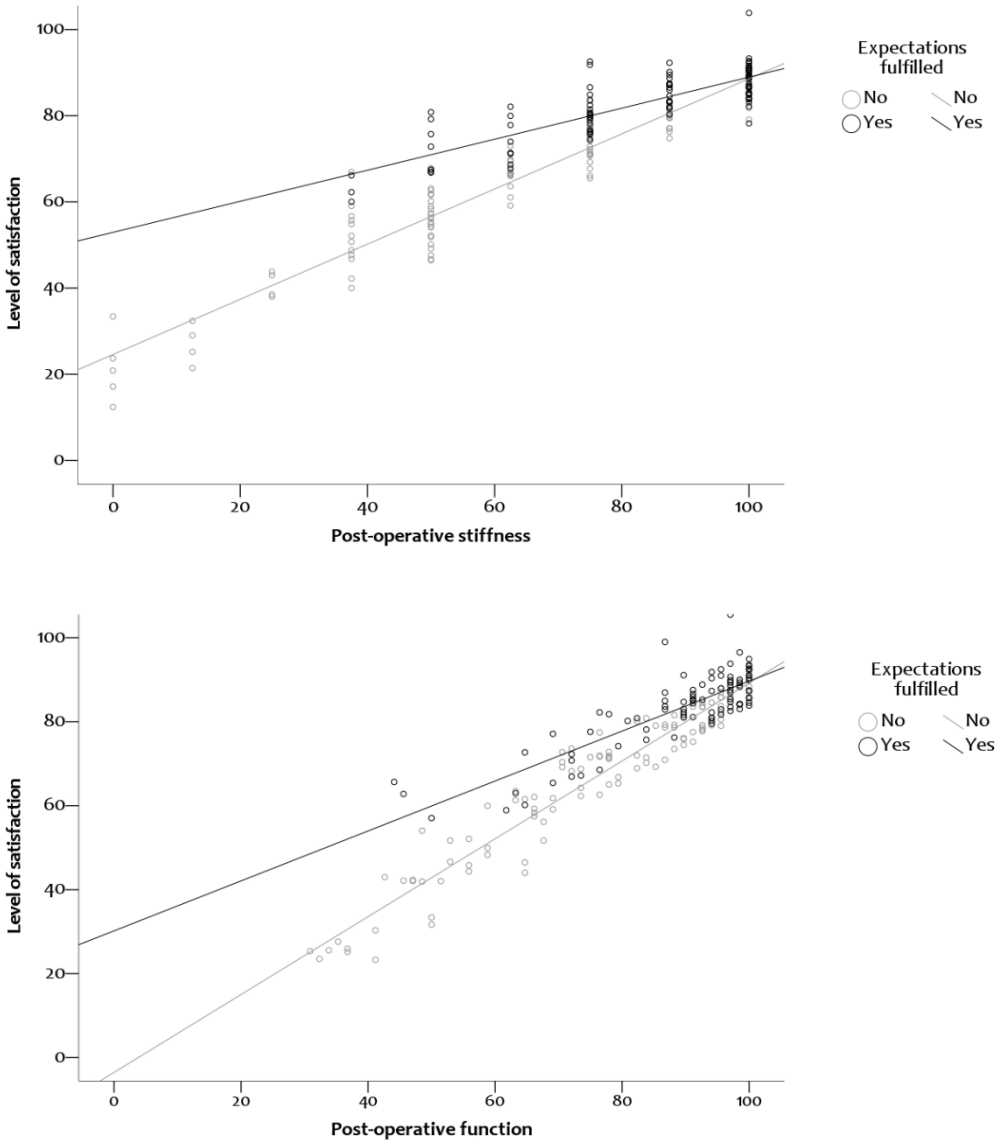


Figure 3 a-c. *Predicted values of level of satisfaction in relationship with postoperative pain (a), stiffness (b) and function (c), stratified between patients whose expectations were fulfilled and patients whose expectations were not fulfilled.*

Patients were split based on their extent of fulfillment of expectations. Patients with a score of 100% and above were classified as patients who had their expectations fulfilled. Patients with a score below 100% were classified as not having their expectations fulfilled.

DISCUSSION

Up to one in four patients is dissatisfied with the outcomes of joint replacement surgery [19,38,56,57]. This study aimed to determine which factors are associated with dissatisfaction and to examine whether the extent of fulfillment of expectations could mediate the effects between preoperative factors and dissatisfaction and moderate the effect between postoperative factors and dissatisfaction. In our study, almost one tenth of hip patients was dissatisfied with the results of surgery. Yet, almost a quarter of knee patients was dissatisfied with the outcomes of surgery, as found before. Preoperative pain, stiffness, and a low level of function were significantly related to a lower level of patient satisfaction, as was found before [38,52,122,270]. However, this effect was fully mediated by the extent of fulfillment of expectations. In addition, as reported in earlier research, postoperative residual pain, stiffness, and a low level of postoperative function were also related to a lower level of patient satisfaction, even though the effect was moderated by the extent of fulfillment of expectations [38,51,52,55,75,77,82,83,120,122,239,247,249,274].

Knee patients usually experience worse outcomes than hip patients [30-33]. Indeed, postoperative level of pain and stiffness were significantly higher in knee patients compared to hip patients. Accordingly, the level of satisfaction and satisfaction rates were also lower in knee patients. In general, knee patients are often more dissatisfied than hip patients [31,32,38]. In our study, the difference between hip and knee patients was significantly related to level of satisfaction, even when controlling for the effects of preoperative and postoperative factors, and fulfillment of expectations. In practice, physicians should be aware of the difference between hip and knee patients. Information regarding ability to improve as a result of surgery should be tailored to the specific patient groups, in order to be able to prevent dissatisfaction.

Patients were the least satisfied with their ability to do sports or recreational activities and to do home or yard work. Likewise, previous research found that satisfaction rates were lowest for high demanding activities as the ascension of stairs [52]. Patients often have higher expectations than physicians with regard to activities that are more

demanding and require more advanced movements [235,236]. If physicians are considered as experts on what to expect, this might explain why patients are dissatisfied with the results of surgery [226,230]. Surgery might simply not be able to fulfill the expectations of patients.

Consistent with the literature, fulfillment of expectations was positively related to a higher level of satisfaction [31,38,55,77,83,119-121,247]. Moreover, the extent of fulfillment of expectations seems to be associated with level of preoperative pain, stiffness, and function. Patients with more symptoms generally have higher expectations, which might not be fulfilled [75,85,87,90,92,99]. Preoperative factors relate to satisfaction, only because they relate to fulfillment of expectations and thereby to satisfaction. In clinical practice, emphasis should be placed on the preoperative symptoms of the patient and their corresponding level of expectations. Discussing patients' expectations are repeatedly reported as the way to prevent the formation of unrealistic expectations [51,52,55]. Therefore, physicians should be made aware of the differences in level of expectations between patients differing in level and amount of osteoarthritis symptoms.

Furthermore, not only preoperative factors were associated with level of satisfaction. Within this study, an interaction effect between postoperative factors and fulfillment of expectations was found. Residual postoperative pain, stiffness and a low level of function were related to dissatisfaction, as was found before [38,52,55,77,78,82,83,120,122,247,249]. Nonetheless, this relationship diminished when patients' expectations were more fulfilled. That is, postoperative symptoms will only relate to dissatisfaction, when levels of pain, stiffness, and function are far apart from expected levels. For instance, some patients might think that residual symptoms are unavoidable [51]. They will consequently not be dissatisfied with residual symptoms since they expected them. On the contrary, patients who did expect to achieve perfect results, will find themselves having unfulfilled expectations and might then be bothered by their postoperative symptoms.

A limitation of this study is the fact that we regarded expectations as one general construct in the relationship with satisfaction. However, some particular domains of (fulfilled) expectations could potentially have more impact on satisfaction, in relationship with pain, stiffness and function, than others. Some domains of expectations (e.g. expectations for more demanding activities that require more advanced movements [235,236]) perhaps may be harder to fulfill. Alternatively, preoperative pain, stiffness, and function might be more related to domains of expectations associated with activities of daily living and less with expectations for psychological well-being, for example. Hence, future research could examine how specific (fulfillment of) expectations of patients could mediate or moderate the relationship between pain, stiffness, function and satisfaction.

In sum, both preoperative and postoperative pain, stiffness, and function do relate to dissatisfaction. Yet, fulfillment of expectations plays major role in explaining this relationship. Preoperative higher level of pain, stiffness, and function relate to less fulfilled expectations and thereby to patient dissatisfaction with outcomes of surgery. Thus, fulfillment of expectations mediates the relationship between preoperative factors and satisfaction. Likewise, postoperative pain, stiffness and function were related to dissatisfaction, as a function of the level of fulfilled expectations. Fulfillment of expectations moderates the relationship between postoperative factors and satisfaction. That is, when the patients' expectations are less fulfilled, the effect of postoperative pain, stiffness and function on satisfaction increases.

CHAPTER 9

GENERAL DISCUSSION

BACKGROUND

Osteoarthritis (OA) is the most common chronic degenerative joint disease in the world [1,2]. The disease is ranked 6 on the list of leading causes of disability in the world and is within the top 5 of leading global causes of years lost due to disability in high income countries [8]. Currently, there is no cure for OA. Therefore, relief of complaints is the foremost goal of treatment [4,18]. In end-stage OA, when physical complaints continue to exist and OA worsens, joint replacement is commonly performed [19-24]. Both hip and knee patients improve in physical function as a result of joint replacement and less than 2% of patients needs revision within one year [21,22,24,27,34-37]. Nevertheless, success of treatment nowadays no longer only depends on the physicians' perspective (i.e., the clinical perspective), but also on the patients' perspective [38-40].

Patients are generally less satisfied with outcomes of TKA and THA than physicians [51-54]. Approximately a quarter of patients shows some degree of dissatisfaction after joint replacement [19,38,52,55-57]. The proportion of dissatisfied patients is higher for knee patients [19,38,52,55-57], who generally obtain less favorable outcomes than hip patients [23,29-33,58]. Residual pain and postoperative impairment in function seem important factors for dissatisfaction [59]. Nonetheless, these factors cannot explain all variance in satisfaction rates, because some patients might agree that residual symptoms are unavoidable[51]. Residual pain or limitations in function in these patients will consequently not negatively affect their satisfaction level when these levels are close to expected levels, while in patients who expected that their pain and function would have gone back to normal, it will[51].

By having certain outcome expectations, patients are more or less able to shape the results of surgery. Optimistic realistic expectations relate to more successful recovery and better general health outcomes [61,64-70]. Yet, the anticipation of a likely result could be erroneous and, therefore, the expectations stay unfulfilled. In fact, up to 50% of TKA and THA patients have unrealistically high expectations of outcomes of joint replacement, which might be unfulfilled [51,75-78]. This imbalance between expectations

and outcomes could cause patient dissatisfaction, considering that patients' expectations will strongly influence the interpretation of the outcome of their joint replacement and their ultimate satisfaction[78].

AIMS OF THE DISSERTATION

A substantial part of patients is dissatisfied after joint replacement. However, the exact origin, prevalence, and correlates of dissatisfaction in TKA and THA patients were still unclear. Moreover, it was, to our knowledge, largely unknown how patients' expectations are formed and how they relate to subjective as well as objective treatment outcomes. Hence, the overall aim of this dissertation was to enhance the understanding of (the relationship between) patients' expectations and satisfaction in orthopedic hip and knee patients, and their relationship with surgical outcomes. This concluding chapter summarizes the findings of the dissertation and considers them within the context of the existing literature. In addition, implications for future research and clinical practice will be discussed.

MAIN FINDINGS

PART I

Expectations for outcomes of surgery

In accordance with previous findings, patients participating in the EXPECT-study reported high expectations for outcomes of THA and TKA [51,75-78]. Their most important expectations concerned improvement in walking ability and pain relief (**chapter 2**). Moreover, most alignment between physicians and patients in terms of expected improvement was also found within these categories (**chapter 5)**. Both patients and physicians expected that joint replacement would at least result in less pain and improved walking ability. Yet, disagreement between hip and knee patients and their physicians in general was high (**chapter 5**). The greatest misalignment existed with regard to more demanding activities that require more advanced movement (e.g., sports and kneeling). Patients often had higher expectations compared to their physicians in these categories. If physicians are considered experts on what to expect

[226,230], this might indicate that surgery will not be able to fulfill these patients' expectations.

Origin of expectations

Crow et al. [63] suggested that patients' expectations could be determined by factors that lay within the patient (Figure 1). Earlier research denoted that among the internal factors that could be related to the formation of expectations are certain sociodemographic (e.g., age) and clinical (e.g., pain) factors, despite inconclusive findings regarding direction and strength of the factors [68,81,84-100]. Therefore, in **chapter 2**, patients' expectations for outcomes of treatment and possible associates of patients' expectations were examined. Findings from a latent class analysis with 287 TKA and THA patients indicated that patients could be classified into three subgroups that differed significantly in level and amount of expectations. Sociodemographic factors were not found to be different between these groups. However, the three subgroups differed significantly in terms of pain, other osteoarthritis symptoms, and functional disability. In accordance with previous findings [81,85,90,92,95,97,99,100], higher expectations were characterized by more preoperative pain, more symptoms (e.g., more stiffness and a more limited range of motion), and more functional disability. Results also showed that patients with more functional disability do not only have high expectations, but also align more in terms of amount and level of expectations with their physicians than patients with better function (**chapter 5**). Patients and physicians generally agree that more disabled patients may expect the most improvement as a result of TKA and THA. Meanwhile, physicians and patients mostly disagree on expected outcomes when patients are low in functional disability.

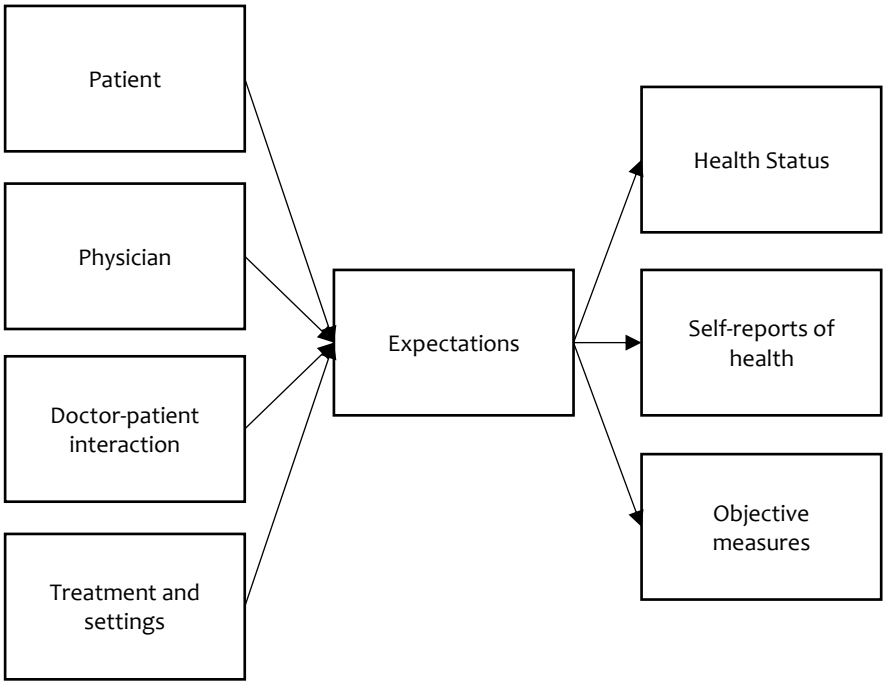


Figure 1. *Conceptual framework examining predictors and outcomes of expectations. Adapted from Crow et al.* [63]

In addition to the patient-related origins of expectations, the physician could also be considered as a factor associated with the level of patient expectations [63] (Figure 1). Within the literature, no differences in level of expectations between THA and TKA patients were found [31,175], even though THA patients often achieve more favorable results than TKA patients [23,29-33]. However, in our sample, the level of expectations did differ between THA and TKA patients. Hip patients had higher expectations than knee patients pre-consultation (**chapter 5**), post-consultation (**chapter 2, 5, 7** and **8**), and pre-surgery (**chapter 5**). Moreover, physicians of hip patients had higher expectations than physicians treating knee patients (**chapter 5** and **7**). Physicians might be aware of more favorable results in THA patients than in TKA patients [23,29-33]. If physicians are aware of the differences in ability to improve between TKA and THA patients, then differences in expectations between these patient groups could be associated with the physicians' expectations. In **chapter 7**, we therefore examined whether the level

of physicians' expectations was related to level of patients' expectations. Indeed, in our sample of 395 patients, physicians' expectations were significantly associated with patients' expectations. In general, the higher physicians' expectations, the higher patients' expectations post-consultation. It is suggested that physicians could, therefore, play an important role as to refrain too optimistic patients' expectations [92,226,228].

However, the findings from **chapter 7** do not implicate that patients' and physicians' expectations usually align. **Chapter 5** examined alignment between patients' and physicians' expectations over time (i.e., pre-consultation, post-consultation and pre-surgery). In at least 74% of the 477 cases, a clinical meaningful difference was found between physicians' and patients' expectations, with patients often having higher expectations than their physicians. Although higher expectations of physicians do relate to higher expectations of patients, a significant gap between patients' and physicians' expectations remains. Moreover, it was found that physicians' arthroplasty volume per year, years of experience of the physician, and other information sources did not contribute to more alignment in expectations. Since it was found that physicians' expectations relate to patients' expectations (**chapter 7**), we expected, at least, a change in alignment between time points at which patients did not have (i.e., pre-consultation) and did have a conversation with the physician (i.e., post-consultation). Nonetheless, agreement in expectations did not change over time. Considering that we measured physicians' expectations at only one time point and compared patients' expectations at different time points to the expectations of physicians, this merely indicates that patients' expectations did not change over time.

The literature shows that outcome expectations are guided by sources outside the self or the physician [63,101,102]. In fact, patients' expectations could even be formed within the interaction of the medical consultation [44,101,103-106] (Figure 1). Accordingly, in **chapter 3** we examined whether (expectations for) outcomes of treatment were discussed within medical consultations. Furthermore, we examined and compared word use of TKA and THA patients and their physicians. Lastly, the relationship

between word use and change in patients' expectations was examined. In the 31 medical consultations analyzed, only 5.5% (i.e., less than 50 seconds) of the duration of the medical consultation was devoted to discussing outcomes of TKA or THA. Word use between TKA and THA patients and their physicians was significantly different. Concerns and needs were mostly non-discussed (i.e., less than 2% of word use was categorized within this category) and patients may fail to disclose their expectations. Notwithstanding, word use of patients and physicians was related to a change in patients' expectations for outcome of treatment.

The suggestion that patients fail to express their outcome expectations was confirmed in **chapter 4**, in which we examined the broader aspect of interactional patterns within medical consultation by using conversation analysis. Patients with high expectations display their expectations seldom explicitly and only in euphemisms such as implicit hopes and wishes, or as references to what other patients achieved as a result of surgery. In contrast, patients with low expectations mostly do not display expectations at all. In fact, physicians are mainly the ones who explicitly explain what can be expected in terms of the outcomes of surgery. We found that within this expression of expectations, surgery is often presented as the definitive solution to the patient's problem. Physicians express advantages of surgery in a more straightforward and explicit manner than disadvantages of surgery. Moreover, physicians display possible benefits of surgery differently in patients with low expectations, as compared to patients with high expectations, as if they have to pull harder to get low expecting patients on par.

PART II

Patient reported outcomes

Hip and knee patients with osteoarthritis often experience limitations in daily living[1-3]. They usually have trouble with general movement and experience pain, muscle weakness, stiffness and swelling [1-3]. In accordance with the literature, hip and knee patients in our sample also experienced more pain, stiffness, and limitations in

function compared to persons from the same age in a general population [267], due to their osteoarthritis (**chapter 2, 5, 7** and **8**).

After surgery, patients reported improved function, less stiffness, and decreased pain (**chapter 7** and **8).** Nevertheless, a clear difference was found between hip and knee patients. Hip patients experienced less pain and stiffness and have better functioning than knee patients, 6 months post-surgery (**chapter 7**) and 1 year post-surgery (**chapter 8).** Additionally, hip patients more often had a minimal clinical important difference (MCID) in pain improvement than knee patients (**chapter 7**). Similar results were previously found, in which knee patients generally obtained less favorable outcomes than hip patients [23,29-33,58]. Crow et al. [63] (Figure 1) pointed out that these particular outcomes could result from patients' expectations. In addition, the response-expectancy theory explained that what patients experience might actually be a result of what they expected to experience [71]. It was previously found that hip and knee patients' expectations were related to more successful recovery and better general health outcomes [64-70,92]. Patients' expectations could potentially influence outcomes if patients believe or expect that particular events will happen to them [69,70]. Patients with high expectations may then be more motivated to obtain the desired results in rehabilitation by attaining to instructions and training and might actually achieve these results through a self-fulfilling prophecy [72,73]. In accordance with this prophecy, we found, in **chapter 7**, that high patients' expectations were related to diminished pain and improved function up to six months after surgery.

Likewise, in knee patients, physicians' expectations were also associated with change in pain and function after surgery. As noted before, physicians were able to influence patients' expectations. As a consequence, they are seemingly able to change knee patients' outcomes after surgery. Physicians in our sample often have lower expectations for knee patients as compared to for hip patients. Their low expectations could then result in patients with low expectations and ultimately little improvement after surgery in knee patients. Physicians, at least in our sample, might be aware of the challenges in outcomes for knee patients than for hip patients.

Indeed, findings in **chapter 3** denote that physicians tended to use more negative words and words that described sadness in conversations with knee patients than with hip patients. Participating in a study concerned with outcome expectations and low satisfaction rates might result in a heightened awareness of disadvantageous outcomes of surgery. Physicians' expectations for knee patients might have been affected, contributing to a more critical view on outcomes in knee patients. Tempering patients' expectations through education is thought of to result in more alignment in expectations [92,226,228,229]. Nonetheless, our findings suggest that the physicians' low expectations perhaps could also result in unmotivated patients in diagnoses that are susceptible to large non-specific treatment effects, as knee osteoarthritis [268].

Yet, even though high patients' expectations relate to a decrease in pain and improvement in function, they were also associated with a lesser extent of fulfillment of expectations (**chapter 7**). This indicates that improvement in pain and function was still less than patients expected, which confirms the findings from earlier research [51,75-78]. This fits the assumption that patients usually have too optimistic expectations, which might not be met, despite the ability of patients' expectations to influence nonspecific treatment effects [51,75-78]. Besides, this seems even more the case for knee patients as compared to hip patients. Regardless of the lower level of expectations in TKA patients as compared to THA patients, the expectations of knee patients were less often fulfilled than the expectations of hip patients six months post-surgery (**chapter 7**) and one year post-surgery (**chapter 8**). Furthermore, a significant difference was also found in level of satisfaction between TKA and THA patients (**chapter 8**). One year after surgery, approximately 10% of hip patients and almost 25% of knee patients was at least mildly dissatisfied with the outcomes of surgery. Both patient groups were most dissatisfied with their ability to do home or yard work and their ability to do sports or recreational activities.

Origin of dissatisfaction

Unfulfilled expectations was the most important determinant of patient dissatisfaction in several studies [31,38,52,55,75,77,78,82,83,101,119-121,126,236,247]. This corresponds with the hypothesis of the expectation-confirmation theory [79], which points out that expectations could lead to dissatisfaction when the perceived performance (which might be patients' postoperative functional status) is not in line with patients' expectations (see Figure 2). Nevertheless, conflicting findings in the literature also exist in which high preoperative expectations, regardless of level of fulfillment, were related to low satisfaction with outcomes of treatment [51,76].

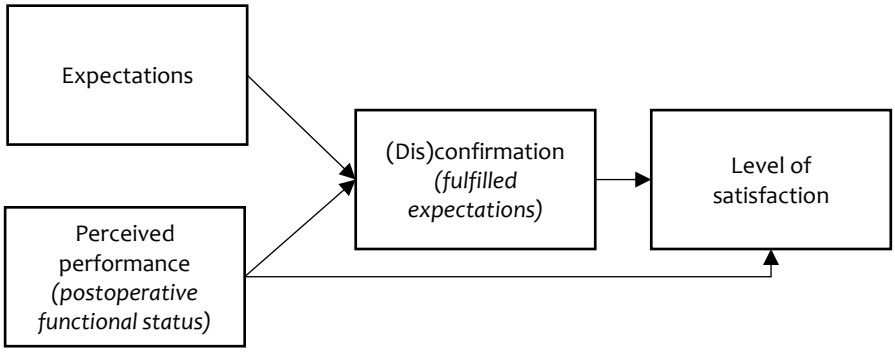


Figure 2. *Expectation-confirmation model. Adapted from Oliver et al.* [79]

Therefore, in **Chapter 6,** we conducted a systematic review and best-evidence synthesis on all studies that examined the relationship between (fulfillment of) outcome expectations in THA and TKA patients and satisfaction with outcome. Twenty-two studies out of 586 records found in PubMed, Web of Science, PsycInfo, Cochrane, and Google Scholar were included in this study. Preoperative expectations were in only half of all studies associated with level of satisfaction, while in almost all (93%) studies, fulfillment of expectations was related to satisfaction. Within the literature, fulfillment of expectations seems a valuable associate of satisfaction in TKA and THA patients. Likewise, in **chapter 8,** this was confirmed within our sample of 393 patients. The extent of fulfillment of expectations was positively associated with level of satisfaction with outcomes of surgery.

Nonetheless, in the literature, other factors were also proposed to be important associates of satisfaction with outcomes. For instance, high levels of preoperative and postoperative pain and stiffness, and a low level of function seem to relate to dissatisfaction in THA and TKA patients [38,51,52,55,75,77,78,81-83,101,120,122,126,239,247,249,270,271,273-279]. Nevertheless, there are also contradicting findings, stating that these factors did not contribute to patients' level of satisfaction [248,249,272,273]. Therefore, in **chapter 8**, the relationship between several perioperative factors, fulfillment of expectations and satisfaction was investigated. We expected that both preoperative and postoperative factors could be associated with patient satisfaction, as a function of the extent of fulfillment of patients' expectations. Previously, in the literature and in our study (**chapter 2)** it was found that preoperative pain, stiffness, and a low level of physical function could relate to high expectations [81,85,90,92,95,97,99,100]. Therefore, they may relate to low fulfillment of expectations and because of that to low satisfaction. Postoperative factors could, on their turn, lead to dissatisfaction, when the expected levels of pain, stiffness and function are far apart from perceived levels [79] (Figure 2). Fulfilled expectations could then be a mediating factor in the relationship between preoperative factors and satisfaction, and a moderating factor in the relationship between postoperative factors and satisfaction.

The findings in **chapter 8** indicate that preoperative pain, stiffness, and function were related to dissatisfaction. However, the relationship was fully mediated by the effect of fulfillment of expectations. Preoperative factors relate to satisfaction, only because they relate to fulfillment of expectations and thereby to satisfaction. Furthermore, postoperative pain, stiffness, and function were also associated with dissatisfaction. Nonetheless, an interaction effect between postoperative factors and fulfillment of expectations indicated that this relationship diminished when patients' expectations were more fulfilled. That is, postoperative symptoms will only relate to dissatisfaction, when levels of pain, stiffness, and function are far apart from expected levels[51], as in accordance with the assimilation-contrast theory [60] (Figure 3).

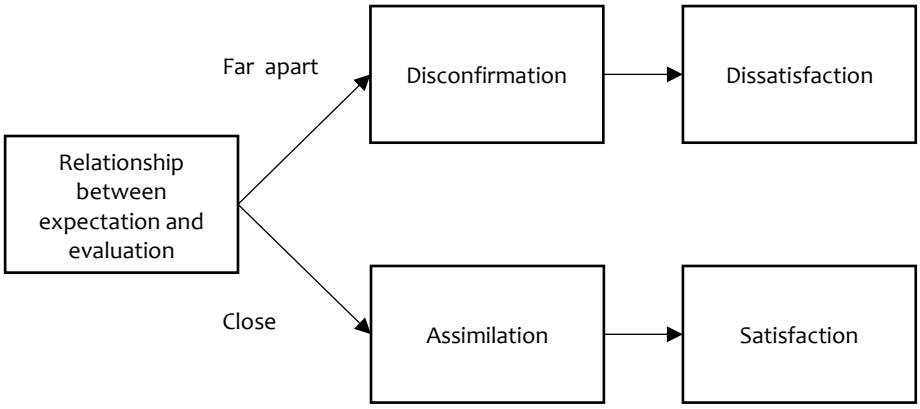


Figure 3. *Assimilation-contrast model. Adapted from Waljee et al.* [60]

From a clinical perspective, joint replacement is a rather successful treatment option in reducing symptoms resulting from hip or knee osteoarthritis. Notwithstanding, patients are often dissatisfied with the outcomes of surgery. Physicians usually rate pain of patients as less and function as better than patients do after treatment [44,54,89,225,235]. This might result from differences in frame of reference [44]. While physicians often compare patient's functioning with functioning of other patients, patients themselves often compare their function with their functioning before injury or onset of disease [44]. Preoperative factors than serve as an anchor for their expectations. Moreover, physicians generally rate function based on clinical improvement, while patients rather base their rating on what activities they expected to perform and subsequently are able or not able to perform [44].

METHODOLOGICAL CONSIDERATIONS & FUTURE DIRECTIONS

The nature and design of the EXPECT-study entail several limitations and strengths that have to be acknowledged.

One limitation concerns the operationalization of the concept 'expectations for outcomes of treatment'. As noted before, patients' outcome expectations particularly pertain a belief or anticipation that certain actions (i.e., surgery) will achieve particular outcomes [61,63,188]. Within our analyses, we regarded (with an exception to **chapter 2**) these expectations as one general construct. Patients had to indicate on several pre-operative questionnaires whether they expected improvement in 18 or 19 domains of the HSS-HRES [126] and the HSS-KRES [86]. These domains were related to categories of symptoms resulting from knee or hip osteoarthritis, activities of daily living, and to general domains of psychological or sexual well-being. Scores from these questionnaires were summed within one variable, as was proposed by the authors of the questionnaires [86,126]. Nevertheless, it is also suggested that the domains could be collapsed into five factors, being: (1) pain, (2) walking ability, (3) ability to engage in essential and (4) nonessential activities and (5) psychological well-being [126]. Moreover, outcome expectations within the literature were not always considered as a general construct, but merely as different aspects of expectations, as for instance, general improvement [38,82,121,126] or more specific, pain level [101,248,249], or functioning [78,248,249]. Additionally, within **chapter 2**, it was suggested that, within our sample, expectations could be grouped into different categories. Not treating expectations for outcomes as a general construct, but regarding them as, for example 3, 4 or 5 distinct categories could additionally have provided us with more information about the relationship of specific expectations with preoperative factors (e.g., clinical and sociodemographic) and outcomes (e.g., postoperative clinical factors and satisfaction). In addition, this could have given more insight in what kind of expectations were likely to stay unfulfilled, that is, what expectations of patients were mostly unrealistic. Therefore, future research should focus on more specific expectations in THA and TKA patients.

Furthermore, we only asked patients *if* they had expectations for outcomes of treatment and *how much* improvement they expected resulting from treatment. However, we did not ask how *important* they thought improvement in those particular domains was to them. Furthermore, we did not ask what patients *want* to result or what patients think *should* result [62]. The concepts of expectations, hopes, wishes and requests are sometimes used interchangeable, yet refer to different constructs [61,105]. Therefore, future research should examine how these different concepts relate to each other and how they correlate with preoperative and postoperative patient factors.

Additionally, the inclusion of patients in our study could have been prone to selection bias. As Eisler stated: "The motivation to undergo surgery reflects its reward value and the expectation of success." [101] That is, patients with higher expectations may be more inclined to want surgery as treatment for their symptoms. Besides, these patients, who might have already had thought about their expectations, might have been more motivated to participate in a study regarding their expectations. Alternatively, the decision to participate in a study that examines expectations might have made people more aware of their own expectations, which could have affected the word use, contents and interaction in the consultation. The increased awareness for expectations of surgery could possibly even have altered patients' expectations. In future research, it should be examined whether there might be a difference in expectations of patients who opt for surgery and who are scheduled for conservative treatment.

Lastly, even though we managed to examine physicians' expectations for outcomes of treatment for each patient, the variable 'alignment between patients' and physicians' expectations' was calculated based on the notion that physicians' expectations will not change over time. However, empirical evidence for the notion that physicians' expectations will not change over time is lacking. Ideally, you should expect physicians' expectations at least to change in time from pre-consultation to post-consultation, as physicians should receive extra information regarding the

patients' wishes, values and preferences, that is, their perspective on treatment outcomes, during consultation. Hence, future research should examine whether (the interaction within) the doctor-patient consultation might be able to change the physicians' view on probable outcomes for patients. Likewise, it should then be examined whether the exploration of the patients' perspective relates to a more tailored view on expected outcomes, that is, to a change in variability in physicians' expectations between patients.

Nevertheless, within the EXPECT-study, we achieved new insights regarding (the relationship between) expectations and satisfaction with outcome in TKA and THA patients. A first strength of the study is, for instance, the fact that both expectations, alignment in expectations, fulfillment of expectations and satisfaction in relationship with pain, function and stiffness were explored, has gained us a more thorough understanding of the relationships between these concepts. Not only do we now know that worse functioning in patients relates to higher expectations and more alignment in expectations between patients and physicians, we do also know that although expectations were more aligned, worse functioning does relate to less fulfillment of expectations and a higher level of dissatisfaction. It therefore seems that, despite the fact that patients and physicians generally agree that low function could be improved as a result of surgery, this level of improvement does not match the patients' expectations and consequently could relate to dissatisfaction. This could possibly be explained by the fact that albeit physicians and patients might generally agree that basal functioning will increase as a result of intervening [20,238], patients have especially high expectations for advanced movement and more demanding activities [85-87,95,139]. These specific high expectations will probably be less fulfilled and could then explain a general tendency of dissatisfaction with outcomes. However, this aspect should be further examined in future research.

A second strength of our study is the fact that, to our knowledge, this study was the first to be able to examine the black box of the medical consultation between physicians and osteoarthritis patients. We were able to examine correlates of

expectations beyond self-reported measures, by investigating word use and the interactional patterns within consultations. Because of that, it is now known that physicians should not only pay attention at the patients' functioning (as this relates to level of expectations and extent of alignment in expectations). In particular, they should pay more attention towards their communication within medical consultations, as it was found that physicians could possibly have a large impact on the formation and adaptation of patients' expectations (see **chapter 7**). In addition to that, we found that patients' generally fail to express their expectations and that they should be encouraged to share their perspective on expected, or wanted, outcomes.

Previous studies mostly focused on TKA patients instead of THA patients or both THA and TKA patients [52,78,122,222]. Within the EXPECT-study, however, we managed to compare expectations and outcomes between THA and TKA patients. Thereby, we uncovered that not only knee patients, but hip patients as well are sometimes dissatisfied with the outcomes of surgery, in spite of the general beneficial outcomes that are presented for hip patients [23,29-33,58]. Furthermore, by comparing hip and knee patients, we found that physicians' expectations were related to improvement in knee patients, but not in hip patients. Hence, future research should investigate why knee patients are generally less satisfied than hip patients and what factors determine whether physicians' expectations are related to outcomes in knee patients and not in hip patients.

Finally, most previous studies that examined fulfillment of expectations only looked at experienced outcomes as a proxy for fulfillment or simply asked patients retrospectively whether their expectations were fulfilled. However, this might result in some sort of recall bias or response shift in which patients change their views about expectations to match their present status [100]. Only one study before told patients what expectations they had cited before and asked how they were now fulfilled [121]. In our study, we compared preoperatively cited expectations with experienced outcomes and herewith computed a variable that displays the extent of fulfillment of expectations. The benefit of comparing expectations to fulfillment of expectations,

in addition to comparing only expectations to achieved outcomes lies within the fact that important findings could have been missed when comparing only the latter. In fact, as was previously stated, high expectations could relate to improvement in outcomes themselves. When neglecting to incorporate fulfillment of expectations, this suggests that high expectations are always beneficial as they could bolster motivation to obtain the expected result [72,73]. Yet, we uncovered that patients are dissatisfied with the outcomes of surgery, just because the improvement in outcomes was still less than expected.

PRACTICE IMPLICATIONS & CONCLUDING REMARKS

It is suggested that physicians could play an important role as to refrain patients' expectations [92,226,228]. In fact, discussing patients' expectations is one of the practices that is repeatedly reported as the way to prevent the formation of unrealistic expectations (e.g., [52,55,72,77,92,222]). However, we found that patients' expectations currently did not change over time; expectations in our sample were rarely discussed. Moreover, surgery is often presented by the physicians as the definitive solution to the patient's problem. Physicians express advantages of surgery in a more straightforward and explicit manner than disadvantages of surgery. In clinical practice, communicational practices within consultations should be improved in order to be able to prevent dissatisfaction following knee and hip replacement, so that high clinical success rates could ultimately be aligned with high patient reported outcomes. Accordingly, patients should be encouraged to express their expectations and physicians should pay more attention to the patients' perspective on expected, and desired, outcomes.

Additionally, more emphasis should be placed at the impact of word choice and general interactional patterns within the consultations on the formation of expectations. Physicians should be informed about their ability to change both the patients' expectations and the experienced outcomes after surgery. They should be trained to reduce unrealistic expectations while maintaining patients' optimism and motivation. Moreover, time should be spend in practice on the discussion of

outcomes, specifically in patients who generally prove to be more dissatisfied, and to obtain less favorable results than others. In addition, not only should disadvantages be displayed more like advantages of surgery are displayed, but they should also be targeted at specific patients, so that patients could understand what disadvantages do apply, or possibly could apply to them, and not only to other patients. A distinction should than, at least, be made between hip and knee patients, as well as between patients high and low in function, as these groups prove to differ on outcomes and/or level of satisfaction after surgery.

Patients and physicians often have a different frame of reference [44], which should be acknowledged in clinical practice. Physicians generally rate function based on clinical improvement, while patients rather base their rating on what activities they expect to perform and subsequently are able or not able to perform [44]. This might result in differences in expectations, observed and/or experienced outcomes and level of satisfaction. Patients, for example, mostly have high expectations for advanced activities, which are often not aligned with the physicians' expectations. In order to be able to align patients' and physicians' expectations and to prevent patient dissatisfaction following surgery, more emphasis should be placed on what the patient wants to achieve and the ability of surgery to meet these expectations.

In sum, the findings from the chapters of this dissertation were in line with our proposed conceptual model, which was a refinement and extension of the previously mentioned models, findings and theories of, among others, Waljee et al. [60], Kirsch et al. [71], Oliver et al. [79], and Crow et al. [63] (see Figure 4). Patients' preoperative expectations were associated with factors within the patient, with physicians' expectations and with interactional patterns in the doctor-patient interaction. Fulfillment of expectations was an important factor related to patient dissatisfaction with outcomes of surgery. Therefore, patients should form and obtain realistic expectations, regarding the possible results of surgery, during and after medical consultation.

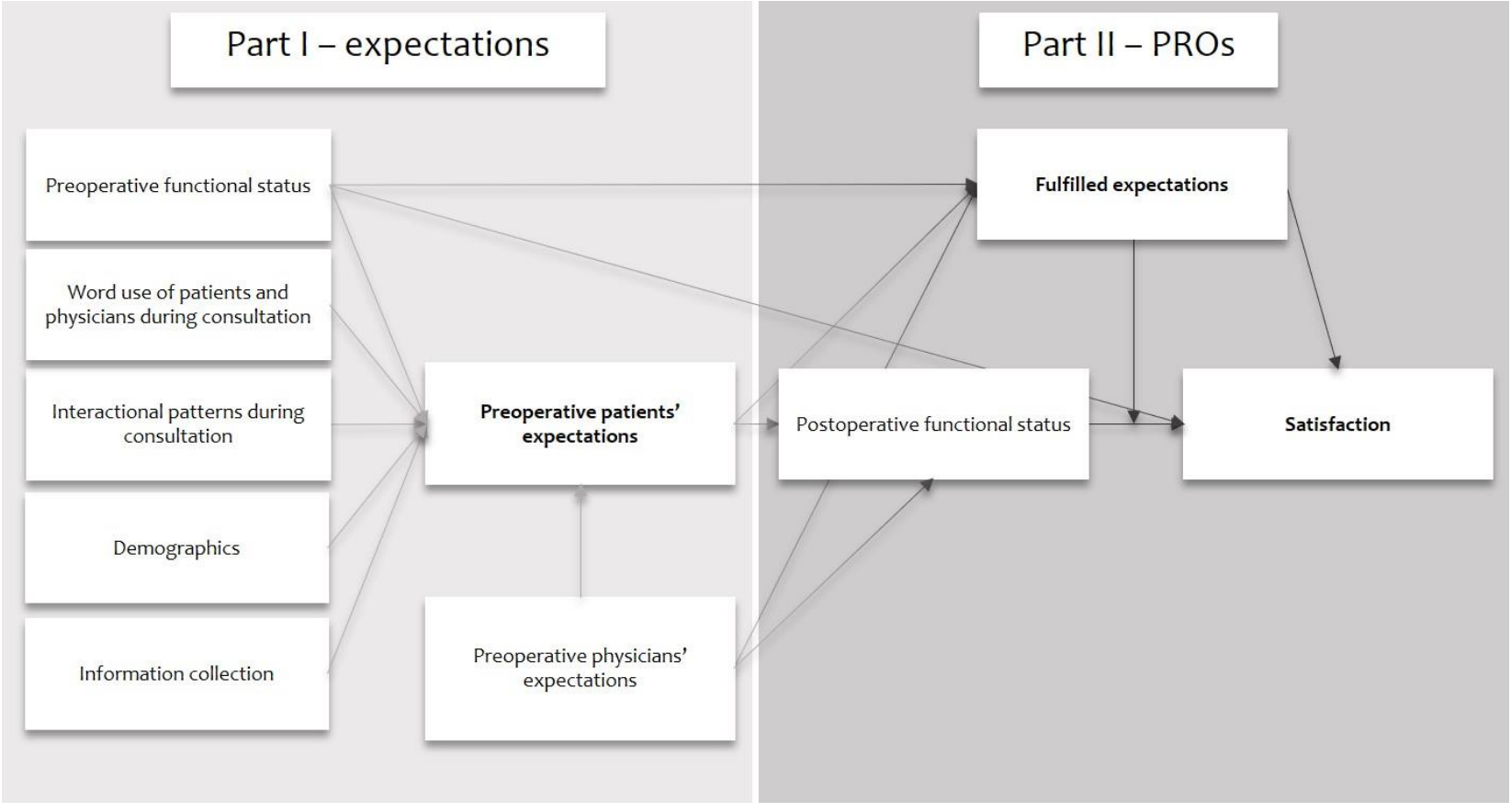


Figure 4. *Proposed model for the two parts regarding the relationship between expectations and patient reported outcomes*

APPENDICES A

NEDERLANDSE SAMENVATTING
(DUTCH SUMMARY)

LIST OF PUBLICATIONS

DANKWOORD
(ACKNOWLEDGEMENTS)

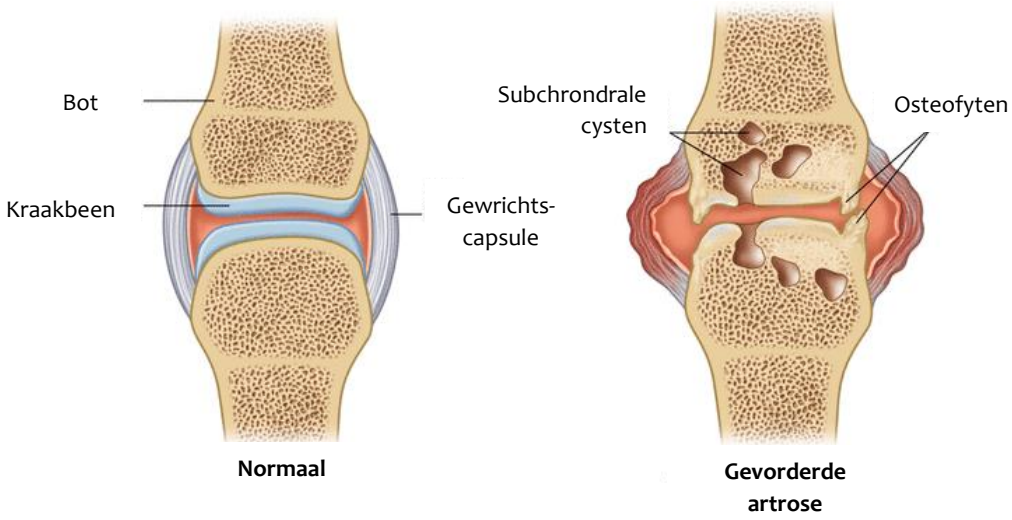
REFERENCES

NEDERLANDSE SAMENVATTING

Dutch summary

INLEIDING

Artrose is de meest voorkomende degeneratieve gewrichtsziekte ter wereld [1,2]. De ziekte wordt gekenmerkt door schade aan, en afbreuk van, kraakbeen in gewrichten [3-6]. Bij gezonde mensen zorgt kraakbeen voor een beschermende laag tussen de gewrichten, die wrijving voorkomt en de impact van gewicht op het gewricht vermindert [6]. Echter, bij artrose zijn bepaalde cellen in disbalans, waardoor er minder kraakbeen wordt aangemaakt [6]. Daarnaast kenmerkt de ziekte zich ook door een verandering in het subchrondrale botweefsel (d.w.z. het botweefsel dat direct te vinden is onder de kraakbeenlaag), de vorming van osteofyten (d.w.z. uitstulpingen van het bot), hypermobiliteit en ontstekingen [4-7].



Figuur 1. *Een normaal gewricht vergeleken met een gewricht met gevorderde artrose. Aangepast van Cividino, & O'Neill.* [7]

Artrose kan voorkomen in alle gewrichten van het lichaam, maar komt vooral voor in de knieën en heupen [1,2]. Patiënten die leiden aan artrose hebben vaak moeite met (trap)lopen en het maken van allerhande bewegingen[1]. Patiënten ervaren meestal pijn, spierzwakte, stijfheid en zwelling van het gewricht, wat kan leiden tot grote beperkingen in activiteiten in het dagelijkse leven [1-3]. De impact van heup- en knieartrose voor patiënten is daarom veel groter dan bij andere vormen van artrose [3]. De ziekte staat op nummer 6 op de wereldlijst van belangrijkste oorzaken van invaliditeit [8] en kost ongeveer 1 miljard euro aan zorg per jaar [14]. Dat is 1.2% van de totale zorgkosten, in Nederland [14].

In Nederland lijdt ongeveer 1 op de 10 mensen (d.w.z. bijna 1,400,000 mensen) aan een vorm van artrose [14]. Het grootste deel hiervan betreft heup- en knieartrose. In de afgelopen 30 jaar is het aantal mensen dat gediagnosticeerd wordt met artrose met 40-55% toegenomen [15]. De verwachting is dat dit aantal nog verder zal stijgen, als gevolg van toenemende obesitas en de toenemende oudere bevolking [15-17]. Artrose heeft niet één specifieke oorzaak, maar de meest belangrijke factor die bepalend is voor het ontstaan van artrose, is leeftijd[1,3,17]. Hoe ouder mensen worden, hoe groter de kans om artrose te ontwikkelen [1,3,17]. Ongeveer 10% van de mannen en 18% van de vrouwen boven de 60 jaar heeft artrose [17]. Andere factoren die meespelen in de ontwikkeling van artrose zijn, onder andere, een eerder fysiek trauma aan de gewrichten, een fysiek veeleisende baan en bijvoorbeeld genetica [1,3,4].

Er is nog geen behandeling die artrose kan genezen. Daarom is het voornaamste doel van huidige behandelingen het verlichten van symptomen [4,18]. Dit kan bereikt worden door bepaalde veranderingen in de levensstijl van patiënten. Patiënten worden daarom geadviseerd om door middel van beweging sterkere spieren te ontwikkelen en om gewicht te verliezen. Pijn kan daarnaast verlicht worden door paracetamol of andere pijnstillers [4,18]. In een eindstadium, wanneer er symptomen blijven bestaan en de artrose erger wordt, kan het vervangen van het gewricht door een prothese als behandeling worden aangeraden [19-24].

Het aantal totale heupprothesen (THP) en totale knieprothesen (TKP) neemt toe. Per jaar worden ongeveer 30,000 artrosepatiënten behandeld met zo'n gewrichtsvervanging [25-27]. Vroeger werd deze behandeling echt gezien als een laatste redmiddel voor patiënten, maar doordat het risico op complicaties is verminderd en uitkomsten verbeterd, lijken steeds meer patiënten in aanmerking te komen voor een THP of TKP. Vanuit het perspectief van de arts zijn deze behandelingen extreem succesvolle behandelopties [23,29-33]. Zowel knie- als heuppatiënten verbeteren over het algemeen in fysieke functie en minder dan 2% van de patiënten moet binnen een jaar opnieuw geopereerd worden [21,22,24,27,34,36,37]. Meer dan 94% van de patiënten krijgt zelfs een prothese die langer dan 9 jaar kan blijven zitten [27].

Desalniettemin hangt het succes van een behandeling tegenwoordig niet alleen meer af van wat de arts vindt, maar ook van wat de patiënt ervaart [38-40]. Naast klinische parameters zijn pijn, (de frequentie en ernst van) symptomen, het functioneren en tevredenheid steeds belangrijker geworden in het bepalen van de uitkomst van een operatie [41,42]. Patiënten kijken, in tegenstelling tot artsen, vaker naar welke activiteiten ze wel of niet kunnen uitvoeren [44], terwijl de arts zich meestal bezig houdt met klinische of radiografische verbetering en de mate van beweging [44,45]. Hierdoor zou het kunnen zijn dat de prioriteiten van de patiënt en de arts niet overeen komen [45]. En inderdaad, sommige patiënten geven aan dat ze niet tevreden zijn met het resultaat, terwijl ze wel degelijk verbeterd zijn na de operatie in bijvoorbeeld hun fysieke functie [38].

Patiënten zijn over het algemeen minder tevreden met de uitkomsten van een THP of TKP dan artsen [51-54]. Tot een kwart van de patiënten is niet tevreden met de uitkomsten van een dergelijke operatie [20,40,56,59-6]. Daarbij zien we dat kniepatiënten over het algemeen minder tevreden zijn dan heuppatiënten [19,38,52,55-57] en dat ze vaak ook mindere resultaten boeken dan heuppatiënten [23,29-33,58]. Je ziet dan ook dat aanhoudende pijn na de operatie en weinig verbetering in functie belangrijke factoren lijken in de bepaling van of iemand wel of niet tevreden is [59]. Desondanks zijn er ook patiënten die ongeacht hun aanhoudende pijn niet ontevreden zijn, omdat

deze patiënten het erover eens zijn dat resterende symptomen onvermijdelijk waren [51]. Aanhoudende pijn zou dan geen invloed hebben op het niveau van tevredenheid, omdat de verwachtte niveaus van pijn dicht bij de ervaren niveaus van pijn liggen [51]. Dit geeft al aan hoe belangrijk het is om de verwachtingen van de patiënt voor de operatie goed te bespreken [51,52,55,61].

Verwachtingen van patiënten kunnen we omschrijven als 'een geloof dat bepaalde acties zullen leiden tot bepaalde uitkomsten' [63]. In wezen gaat dit dan om een verwachting over wat een operatie voor ze zal doen [61]. Door het hebben van bepaalde verwachtingen zijn patiënten min of meer in staat om de resultaten van die operatie vorm te geven. Uit onderzoek is namelijk gebleken dat optimistische, realistische verwachtingen verband kunnen houden met een meer succesvol herstel en betere algemene gezondheidsresultaten [61,64-70]. Dit zou kunnen komen doordat patiënten meer gemotiveerd zijn om de verwachtte resultaten ook daadwerkelijk te behalen door meer hun best te doen tijdens de revalidatie [72].

Toch kunnen verwachtingen van een patiënt ook averechtse effecten hebben. Het kan namelijk zo zijn dat een verwachting over de uitkomst van een behandeling van een patiënt foutief is en daarom niet vervuld kan worden. Zo zien we in de literatuur dat tot 50% van de patiënten met een TKP of THP vooraf te hoge, onrealistische verwachtingen had over de uitkomst van de operatie, die onvervuld bleven [51,75-78]. Wat bijvoorbeeld is gevonden is dat, ondanks dat in een onderzoek 85% van de patiënten had verwacht geen pijn meer te hebben na de behandeling, maar 43% van de patiënten dit resultaat daadwerkelijk had bereikt [75]. Dit kan dan leiden tot ontevredenheid, omdat hetgeen de patiënt ervaart niet overeenkomt met hetgeen de patiënt had verwacht [22,31,77-83]. Het niet vervuld krijgen van je verwachtingen wordt in de literatuur dan ook wel gezien als de meest belangrijke bepaler van de tevredenheid van een patiënt [22,31,77,80-83].

Uit onderzoek is gebleken dat patiëntverwachtingen gerelateerd kunnen zijn aan bijvoorbeeld leeftijd, geslacht en mate van pijn voor de operatie [68,81,84-100]. Evenzo lijkt

het ook alsof verwachtingen bepaald kunnen worden door bronnen buiten de patiënt, zoals vrienden, familie, media of eerdere behandelingen [63,101,102]. Het blijkt zelfs zo te zijn dat 40% van de verwachtingen van de patiënt wordt gevormd binnen het consult met de arts [44,101,103-106]. Daarentegen zien we ook dat verwachtingen eigenlijk zelfden expliciet worden besproken in een consult [99,107-110].

DE EXPECT-STUDIE

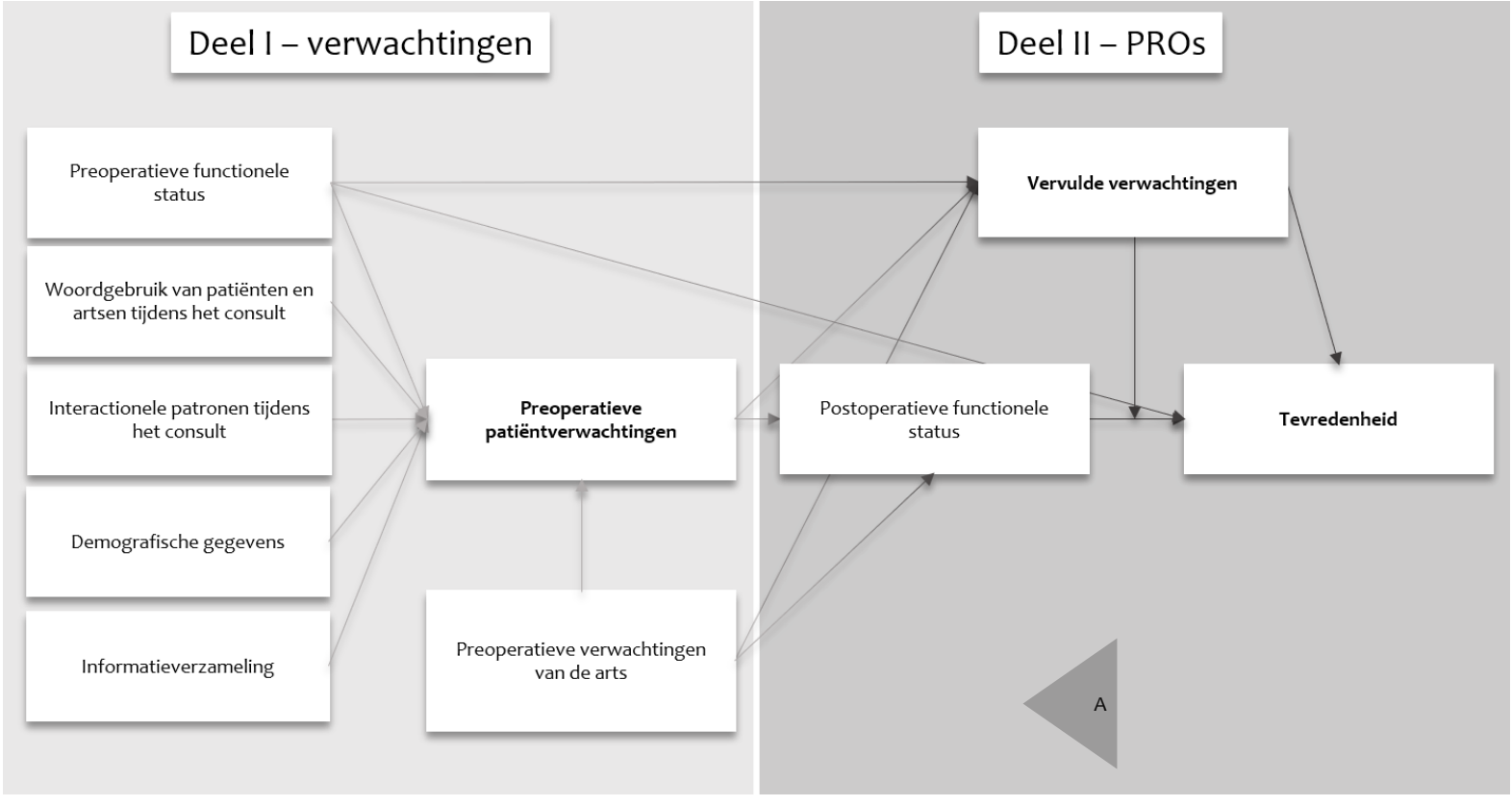
De EXPECT-studie is een prospectieve observationele studie die gestart werd in november 2016. De studie onderzoekt de relatie tussen verwachtingen en tevredenheid bij patiënten met heup- en knieartrose, tot één jaar na de operatie. Dit doen we met zowel kwantitatieve als kwalitatieve methoden. Binnen het onderzoek worden audio- en video-opnames van het medisch consult gebruikt, evenals vragenlijstgegevens. Het onderzoek is uitgevoerd op de afdeling Orthopedie van het Elisabeth-TweeSteden Ziekenhuis in Tilburg.

Patiënten die door hun huisarts doorverwezen zijn naar de afdeling Orthopedie met symptomen van artrose, waaronder pijn en stijfheid tijdens rust en tijdens activiteiten, wat leidde tot beperkingen in het dagelijks leven, kwamen in aanmerking voor deelname aan de studie. Alle patiënten werden minstens 48 uur voor het begin van hun consult geïnformeerd over het doel en de inhoud van het onderzoek. Vervolgens werd aan hen gevraagd om een eerste vragenlijst (T0) in te vullen, direct bij aankomst in het ziekenhuis. Hierop konden ze invullen wat ze voor behandeling verwachtten en wat ze als uitkomst van die behandeling verwachtten. Ook werden de artsen gevraagd om eenzelfde soort vragenlijst in te vullen en daarin aan te geven wat hun verwachtingen waren over de uitkomsten van de behandeling voor iedere specifieke patiënt. Bij het begin van het consult werden patiënten in een, voor dit onderzoek, met camera's uitgeruste consultatieruimte gezet. Het consult tussen de patiënt en arts werd opgenomen op beeld en geluid zodra de arts de spreekkamer binnen kwam. Wanneer het consult werd afgesloten werd ook de camera uitgezet. Deze opnames zijn achteraf letterlijk getranscribeerd en geanalyseerd.

Patiënten kregen vragenlijsten op één of zes extra tijdstippen afhankelijk van hun behandeling. Patiënten die na het consult een conservatieve behandeling kregen, ontvingen enkel een tweede vragenlijst een week na hun consult (T1), terwijl patiënten die gepland zouden worden voor een THP of TKP ook vragenlijsten ontvingen een week voor operatie (T2), vijf weken na operatie (T3), drie maanden na operatie (T4), zes maanden na operatie (T5) en een jaar na operatie (T6).

DOEL VAN DIT PROEFSCHRIFT

Een aanzienlijk deel van de patiënten is ontevreden met de uitkomsten van een THP of TKP. De exacte oorzaak en prevalentie van ontevredenheid bij deze patiënten blijven echter onduidelijk. Bovendien is het, voor zover ons bekend, grotendeels onbekend hoe patiëntverwachtingen worden gevormd en hoe deze relateren aan zowel subjectieve als eelobjectieve uitkomsten na een behandeling. Daarom is het algemene doel van dit proefschrift om het begrip van (de relatie tussen) verwachtingen (DEEL I) en tevredenheid van orthopedische heup- en kniepatiënten en de relatie met chirurgische uitkomsten te verbeteren (DEEL II). De hoofstukken van dit proefschrift zijn in overeenstemming met een vooropgesteld conceptueel model, dat een verfijning en uitbreiding is van de eerdergenoemde modellen, bevindingen en theorieën van onder andere Waljee et al. [60], Kirsch et al. [71], Oliver et al. [79], en Crow et al. [63] (zie Figuur 2).



Figuur 2. *Voorgesteld model voor de twee delen met betrekking tot de relatie tussen verwachtingen en door de patiënt gerapporteerde uitkomsten*

BELANGRIJKSTE BEVINDINGEN

DEEL I

Verwachtingen over de uitkomst van een operatie

Patiënten die deelnamen aan de EXPECT-studie hadden hoge verwachtingen voor de uitkomst van een THP of TKP. Dit is in overeenstemming met resultaten uit eerdere studies. Patiënten hadden als meest belangrijke verwachting een verbetering in het loopvermogen en pijnverlichting (**hoofdstuk 2**). Bovendien kwamen de verwachtingen van de patiënt en arts op deze gebieden ook het meest overeen (**hoofdstuk 5**). Zowel artsen als patiënten verwachtten dat een THP of TKP op zijn minst zou resulteren in minder pijn en een verbetering in het loopvermogen. Toch zagen we dat, over het algemeen, patiënten en artsen veel verschilden in hun verwachtingen (**hoofdstuk 5**). Het grootste verschil tussen patiënt en arts had betrekking op verwachtingen voor veeleisende activiteiten die meer geavanceerde bewegingen vereisen (bijvoorbeeld sporten of knielen). Patiënten hadden in deze categorieën vaak hogere verwachtingen dan hun artsen. Als je de arts dan als expert zou beschouwen over wat je zou mogen verwachten, dan kan dit erop wijzen dat een operatie niet in staat zal zijn om aan de verwachtingen van de patiënten te voldoen.

Herkomst van verwachtingen

Verwachtingen van patiënten kunnen ontstaan door bepaalde factoren binnenin de patiënt [63,68,81,84-100]. Eerder onderzoek wees uit dat bij de vorming van verwachtingen bepaalde sociodemografische factoren (bijvoorbeeld leeftijd) en klinische (bijvoorbeeld pijn) factoren betrokken kunnen zijn, ondanks tegenstrijdige bevindingen met betrekking tot de richting en de sterkte van deze factoren [68,81,84-100]. Daarom hebben we in **hoofdstuk 2** van dit proefschrift onderzoek gedaan naar de verwachtingen van de patiënten over de uitkomst van de behandeling en factoren die mogelijk gerelateerd zijn aan deze verwachtingen. Resultaten van de analyses met 287 knie- en heuppatiënten laten zien dat patiënten kunnen worden ingedeeld in drie verschillende subgroepen, die aanzienlijk verschillen qua niveau en hoeveelheid van hun verwachtingen. Sociodemografische factoren verschilden niet tussen deze groepen, maar de subgroepen verschilden wel met betrekking tot niveau van pijn, het

hebben van andere artrose-symptomen en beperkingen in fysieke functie. In overeenstemming met eerdere bevindingen [81,85,90,92,95,97,99,100], werden hogere verwachtingen gekenmerkt door meer preoperatieve pijn, meer symptomen (bijvoorbeeld meer stijfheid en een beperkter bewegingsbereik) en meer fysieke beperkingen. Aanvullend op deze bevindingen toonden de resultaten aan dat patiënten met meer functionele beperkingen niet alleen hogere verwachtingen hadden, maar ook qua hoeveelheid en niveau van verwachtingen meer overeenkwamen met hun artsen dan patiënten met een beter fysiek functioneren (**hoofdstuk 5**). Patiënten en artsen zijn het er dus, over het algemeen, over eens dat patiënten met meer beperkingen de meeste verbetering kunnen verwachten als gevolg van de operatie.

Naast de patiënt-gerelateerde oorsprong van verwachtingen kan de arts ook worden beschouwd als een factor die verband kan houden met het niveau van patiëntverwachtingen [63]. In de literatuur werden geen verschillen in verwachtingen tussen THP- en TKP-patiënten gevonden [31,175], hoewel THP-patiënten vaak gunstigere resultaten behalen dan TKP-patiënten [23,29-33]. Daarentegen werd in onze steekproef wel een verschil gevonden in het niveau van verwachtingen tussen THP- en TKP-patiënten. Heuppatiënten hadden hogere verwachtingen dan kniepatiënten pre-consultatie (**hoofdstuk 5**), post-consultatie (**hoofdstuk 2, 5, 7** en **8**) en pre-operatie (**hoofdstuk 5**). Bovendien hadden artsen van heuppatiënten ook hogere verwachtingen dan artsen van kniepatiënten (**hoofdstuk 5** en **7**). Artsen zouden misschien bewust kunnen zijn van de meer gunstige resultaten in THP-patiënten in vergelijking met TKP-patiënten [23,29-33]. Als deze artsen dan bewust zijn van de verschillen tussen THP- en TKP-patiënten in mogelijkheden om te verbeteren na een operatie, dan zouden verschillen in patiëntverwachtingen tussen deze twee patiëntgroepen misschien wel gerelateerd kunnen zijn aan de verwachtingen van de arts. Daarom hebben we in **hoofdstuk 7** onderzocht of het niveau van de verwachtingen van de arts geassocieerd kon worden met het niveau van de patiëntverwachtingen. En inderdaad, in onze steekproef van 395 patiënten waren de verwachtingen van de arts significant gerelateerd aan de verwachtingen van de

patiënt. Over het algemeen kan gesteld worden dat hoe hoger de verwachtingen van de arts waren, hoe hoger de verwachtingen van de patiënten na het consult. Artsen zouden daarom een belangrijke rol kunnen spelen in het ombuigen van te optimistische verwachtingen van patiënten [92,226,228].

Desalniettemin betekenen de resultaten uit **hoofdstuk 7** niet dat de verwachtingen van patiënten en artsen vaak overeenkwamen. **Hoofdstuk 5** heeft de mate van overeenstemming tussen de verwachtingen van de arts en patiënt over de tijd (d.w.z. van pre-consultatie naar post-consultatie en pre-operatie) heen onderzocht. In minstens 74% van de 477 gevallen werd er een klinisch belangrijk verschil gevonden tussen de verwachtingen van de artsen en de patiënten. Patiënten hebben vaker hogere verwachtingen dan hun artsen. Hoewel hogere verwachtingen van artsen over het algemeen verband houden met hogere verwachtingen van patiënten, blijft er een aanzienlijke kloof bestaan tussen de verwachtingen van artsen en patiënten. Bovendien werd ook gevonden dat het aantal operaties per jaar en de ervaring in jaren van artsen, en het verschil in mogelijke informatiebronnen voor patiënten, niet bijdroegen aan een kleiner verschil in verwachtingen tussen artsen en patiënten. Omdat bleek dat de verwachtingen van de artsen verband hielden met de verwachtingen van patiënten (**hoofdstuk 7**), hadden we verwacht dat er in ieder geval een verandering (d.w.z. verbetering) in overeenstemming zou komen tussen tijdstippen waarop patiënten niet hadden gesproken met de arts (voor het consult) en tijdstippen na het consult met de arts. Desondanks veranderde het verschil in verwachtingen tussen artsen en patiënten niet in de loop van de tijd. Aangezien we de verwachtingen van artsen op slechts één tijdstip hebben gemeten en de verwachtingen van patiënten op verschillende tijdstippen hebben vergeleken met de verwachtingen van de artsen, geeft dit aan dat de verwachtingen van patiënten in de loop van de tijd dus niet zijn veranderd.

De literatuur laat zien dat verwachtingen over de uitkomst van een behandeling bepaald kunnen worden door bepaalde factoren buiten de patiënt of de arts [63,101,102]. De verwachtingen van de patiënten zouden zelfs gevormd kunnen worden in de

interactie tijdens het medische consult [44,101,103-106]. Dienovereenkomstig onderzochten we in **hoofdstuk 3** of (verwachtingen over) uitkomsten van de behandeling werden besproken in medische consulten. Verder hebben we het woordgebruik van TKP- en THP-patiënten en hun artsen onderzocht en vergeleken. Tenslotte werd in dit hoofdstuk ook de relatie tussen het woordgebruik en een mogelijke verandering in verwachtingen van patiënten onderzocht. In de 31 geanalyseerde consulten was slechts 5.5% (d.w.z. minder dan 50 seconden) van de duur van het consult gewijd aan het bespreken van mogelijke resultaten na een THP- of TKP-operatie. Het woordgebruik van artsen en patiënten verschilde daarin aanzienlijk. Bovendien werden zorgen en behoeften meestal niet besproken (minder dan 2% van het woordgebruik konden we onderbrengen in deze categorie); patiënten lijken hun verwachtingen vaak niet te delen. Desondanks was het woordgebruik van patiënten en artsen toch gerelateerd aan een verandering in de verwachtingen van patiënten.

Het idee dat patiënten hun verwachtingen niet uiten, werd bevestigd in **hoofdstuk 4**, waarin we het bredere aspect van interactiepatronen binnen het medische consult onderzochten, met behulp van conversatieanalyse. We vonden dat patiënten hun hoge verwachtingen zelfden expliciet tonen, en alleen in eufemismen als impliciete verwijzingen naar wat ze hopen of wensen. Patiënten neigen dan soms ook hierin te verwijzen naar wat andere patiënten bereikt hebben als gevolg van een operatie. Patiënten met lage verwachtingen daarentegen geven vaak helemaal niet aan wat ze verwachten. In feite zijn het vooral de artsen die expliciet uitleggen wat er verwacht kan worden van de resultaten van een operatie. Chirurgie wordt dan vaak gepresenteerd als de definitieve oplossing voor het probleem van de patiënt. Artsen drukken de voordelen van een operatie op een meer eenvoudige en expliciete manier uit dan de nadelen van een operatie. Bovendien geven artsen mogelijke voordelen van chirurgie anders weer bij patiënten met lagere verwachtingen, in vergelijking met patiënten met hoge verwachtingen, alsof ze harder zouden moeten werken om de patiënten met lage verwachtingen op een lijn met hun eigen verwachtingen te krijgen.

DEEL II

Patiënt-gerapporteerde uitkomsten

Heup- en kniepatiënten met artrose ervaren vaak beperkingen in het dagelijkste leven [1-3]. Ze hebben meestal moeite met allerlei bewegingen en ervaren pijn, spierzwakte, stijfheid en zwelling van het gewricht [1-3]. De resultaten in onze steekproef komen overeen met de literatuur: heup- en kniepatiënten ervaarden meer pijn, stijfheid en beperkingen in functioneren vanwege hun artrose dan personen van dezelfde leeftijd in een algemene populatie zonder artrose [2,6,7] (**hoofdstuk 2, 5, 7** en **8**).

Patiënten rapporteerden een verbeterde functie, minder stijfheid en verminderde pijn na de operatie (**hoofdstuk 7** en **8**). Niettemin werd er een duidelijk verschil gevonden tussen heup- en kniepatiënten. Heuppatiënten ondervonden minder pijn en stijfheid en functioneerden beter dan kniepatiënten zowel 6 maanden na operatie (**hoofdstuk 7**) als 1 jaar na de operatie (**hoofdstuk 8**). Bovendien hadden kniepatiënten vaker een minimaal klinisch relevant verschil in pijnverbetering dan heuppatiënten (**hoofdstuk 7**). Eerder werden er vergelijkbare resultaten gevonden, waarbij kniepatiënten over het algemeen minder gunstige resultaten verkregen als resultaat van een operatie dan heuppatiënten [23,29-33,58]. Deze specifieke resultaten zouden kunnen voortvloeien uit de verwachtingen van de patiënt [63]. Voorts geeft de respons-verwachtingstheorie ook weer dat hetgeen patiënten ervaren mogelijk een gevolg is van wat ze verwachtten te ervaren [71]. Eerder werd al vastgesteld dat de verwachtingen van heup- en kniepatiënten gekoppeld konden worden aan een succesvoller herstel en betere algemene gezondheidsresultaten [64-70,92]. De verwachtingen van patiënten kunnen de uitkomsten mogelijk beïnvloeden doordat patiënten geloven of verwachten dat bepaalde gebeurtenissen hen zullen overkomen [69,70]. Patiënten met hoge verwachtingen kunnen dan meer gemotiveerd zijn om de gewenste resultaten te verkrijgen door zich tijdens de revalidatie meer te houden aan de instructies en training. Ze zouden deze resultaten dan zelfs kunnen bereiken door een 'zelfvervullende voorspelling' (self-fulfilling prophecy) [72,73]. Overeenkomstig met deze profetie, vonden we in **hoofdstuk 7** dat de hoge

verwachtingen van patiënten inderdaad geassocieerd konden worden met verminderde pijn en verbeterde functie tot zes maanden na de operatie.

Bij kniepatiënten werden de verwachtingen van artsen ook geassocieerd met verandering in pijn en functie na de operatie. Zoals eerder opgemerkt, konden artsen de verwachtingen van patiënten beïnvloeden. Als gevolg hiervan zijn ze schijnbaar in staat om de resultaten van kniepatiënten na een operatie te veranderen. Artsen in onze steekproef hadden vaak lagere verwachtingen voor kniepatiënten dan voor heuppatiënten. Hun lage verwachtingen kunnen dan resulteren in patiënten met lage verwachtingen en uiteindelijk weinig verbetering na een operatie bij kniepatiënten. Artsen, althans in onze steekproef, zijn zich misschien bewust van de uitdagingen in uitkomsten voor kniepatiënten ten opzichte van de resultaten bij heuppatiënten. De bevindingen in **hoofdstuk 3** geven inderdaad aan dat artsen de neiging hadden om meer negatieve woorden en woorden die droefheid uitdrukten te beschrijven in gesprekken met kniepatiënten in vergelijking met gesprekken met heuppatiënten. Deelname aan een onderzoek over verwachtingen over de uitkomst van een behandeling en lage tevredenheidscijfers kan leiden tot een verhoogd bewustzijn van nadelige uitkomsten van een operatie. De verwachtingen van artsen voor kniepatiënten kunnen dan hierdoor zijn beïnvloed, wat zou hebben kunnen bijdragen aan een meer kritische kijk op de resultaten bij kniepatiënten. In de literatuur wordt gesuggereerd dat het temperen van de verwachtingen van patiënten door middel van educatie kan leiden tot meer overeenkomst in de verwachtingen [92,226,228,229]. Niettemin laten onze bevindingen zien dat de lage verwachtingen van de arts misschien ook kunnen leiden tot ongemotiveerde patiënten met diagnoses die vatbaar zijn voor grote niet-specifieke behandelingseffecten, zoals bij knieartrose [268].

Hoewel de hoge verwachtingen van patiënten verband houden met een afname van pijn en een verbetering in functie, werden ze ook geassocieerd met een mindere mate van vervulling van verwachtingen (**hoofdstuk 7**). Dit geeft aan dat de verbetering in pijn en functie nog steeds minder was dan verwacht door de patiënten, hetgeen de bevindingen uit eerder onderzoek bevestigt [51,75-78]. Dit sluit aan bij de veronderstelling

dat patiënten meestal te optimistische verwachtingen hebben, waaraan misschien niet wordt voldaan, ondanks het vermogen van de patiënten om door middel van hun verwachtingen de behandelingseffecten te beïnvloeden [51,75-78]. Dit geldt vooral voor TKP-patiënten en minder voor THP-patiënten. Ongeacht de lagere verwachtingen bij kniepatiënten in vergelijking met heuppatiënten werden de verwachtingen van kniepatiënten minder vaak vervuld dan verwachtingen van heuppatiënten zes maanden na de operatie (**hoofdstuk 7**) en één jaar na de operatie (**hoofdstuk 8**). Verder werd ook een significant verschil gevonden in de mate van tevredenheid tussen knie- en heuppatiënten (**hoofdstuk 8**). Een jaar na de operatie was ongeveer 10% van de heuppatiënten en bijna 25% van de kniepatiënten op zijn minst licht ontevreden over de uitkomsten van de operatie. Beide patiëntgroepen waren het meest ontevreden over hun vermogen om binnenshuis of in de tuin te werken en met hun vermogen om sportieve of recreatieve activiteiten uit te voeren.

Ontstaan van ontevredenheid

Onvervulde verwachtingen was de meest belangrijke bepalende factor voor ontevredenheid onder patiënten in verschillende eerdere studies [31,38,52,55,75,77,78,82,83,101,119-121,126,236,247]. Dit komt overeen met de hypothese uit de verwachting-bevestigingstheorie (the expectation-confirmation theory [79]), die erop wijst dat verwachtingen kunnen leiden tot ontevredenheid wanneer de waargenomen prestaties (bijvoorbeeld de postoperatieve functionele status van de patiënt) niet in lijn zijn met de verwachtingen van de patiënt. Niettemin bestaan er ook tegenstrijdige bevindingen waarin hoge preoperatieve verwachtingen, ongeacht het niveau van vervulling, gerelateerd waren aan lage tevredenheid over de uitkomsten van de behandeling [51,76].

Daarom hebben we in **hoofdstuk 6** een systematische review en 'best-evidence' synthese uitgevoerd op alle bestaande studies die de relatie onderzochten tussen (het vervullen van) verwachtingen over de uitkomst van een THP of TKP en tevredenheid met de uitkomst van deze behandeling. Tweeëntwintig studies uit 586 mogelijke studies van PubMed, Web of Science, PsycInfo, Cochrane en Google

Scholar werden opgenomen in deze studie. Preoperatieve verwachtingen waren in slechts de helft van alle studies geassocieerd met het niveau van tevredenheid, terwijl in bijna alle studies (93%) het vervuld krijgen van verwachtingen gerelateerd was aan patiënttevredenheid. Binnen de literatuur lijkt het vervuld krijgen van verwachtingen dus een belangrijke factor die bijdraagt aan de tevredenheid van THP- en TKP-patiënten. Dit werd binnen onze steekproef van 393 patiënten bevestigd in **hoofdstuk 8.** De mate waarin aan de verwachtingen van de patiënten werd voldaan, bleek positief verbonden aan de mate van tevredenheid met de uitkomsten van de operatie.

In de literatuur werden echter ook andere factoren voorgesteld die een belangrijke bijdrage zouden kunnen leveren aan de tevredenheid van patiënten. Hoge niveaus van preoperatieve en postoperatieve pijn en stijfheid en een laag niveau van (preoperatief en postoperatief) functioneren, bijvoorbeeld [38,51,52,55,75,77,78,81-83,101,120,122,126,239,247,249,270,271,273-279]. Maar er zijn ook bevindingen die aangeven dat deze factoren juist niet zouden kunnen bijdragen aan het niveau van tevredenheid van patiënten [248,249,272,273]. Daarom hebben we in **hoofdstuk 8** de relatie tussen de verschillen perioperatieve factoren, de vervulling van verwachtingen en tevredenheid onderzocht. We verwachtten dat zowel preoperatieve als postoperatieve factoren konden worden geassocieerd met de tevredenheid van de patiënt, afhankelijk van de mate waarin aan de verwachtingen van de patiënt werd voldaan. Eerder werd in de literatuur [81,85,90,92,95,97,99,100], en in onze eigen studie (**hoofdstuk 2**) gevonden dat veel preoperatieve pijn, stijfheid en een laag niveau van fysieke functie verband kon houden met hoge verwachtingen. Deze factoren zouden daarom ook betrekking kunnen hebben op een lage vervulling van verwachtingen en daardoor ook op een lage tevredenheid. Postoperatieve factoren kunnen op hun beurt leiden tot ontevredenheid, wanneer de verwachte niveaus van pijn, stijfheid en functie ver afwijken van de waargenomen niveaus [79]. Vervulde verwachtingen kunnen dan een mediator zijn in de relatie tussen preoperatieve factoren en tevredenheid en een modererende factor in de relatie tussen postoperatieve factoren en tevredenheid.

De bevindingen uit **hoofdstuk 8** bevestigen dat preoperatieve pijn, stijfheid en functie gerelateerd zijn aan ontevredenheid. De relatie werd echter volledig gemedieerd door het effect van het vervullen van verwachtingen. Preoperatieve factoren kunnen geassocieerd worden met tevredenheid, alleen omdat ze gerelateerd zijn aan het voldoen van verwachtingen en daarmee aan tevredenheid. Ook postoperatieve pijn, stijfheid en functie waren gerelateerd aan tevredenheid. Desalniettemin gaf een interactie-effect tussen postoperatieve factoren en het kunnen voldoen aan de verwachtingen van de patiënt aan dat deze relatie afnam naarmate de verwachtingen van de patiënt meer vervuld werden. Dat wil zeggen dat postoperatieve symptomen alleen geassocieerd zijn met ontevredenheid, wanneer de niveaus van pijn, stijfheid en functie ver verwijderd zijn van de verwachte niveaus [51,60].

CONCLUSIE

Kortom, de bevindingen uit de hoofdstukken van dit proefschrift waren in lijn met ons voorgestelde conceptuele model, dat een verfijning en uitbreiding was van de eerdergenoemde modellen, bevindingen en theorieën van onder andere Waljee et al. [60], Kirsch et al. [71], Oliver et al. [79], and Crow et al. [63] (zie figuur 2). De preoperatieve verwachtingen van patiënten konden worden geassocieerd met factoren binnen de patiënt, met de verwachtingen van artsen en met interactiepatronen in de het consult met de arts en patiënt. Het vervullen van verwachtingen was een belangrijke factor in relatie tot de ontevredenheid van de patiënt over de uitkomsten van een operatie. Daarom moeten patiënten tijdens en na medisch overleg realistische verwachtingen vormen en verkrijgen over de mogelijke resultaten van een operatie.

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Hafkamp, F.J., Lodder, P., de Vries, J., Gosens, T, & den Oudsten, B.L. Characterizing patients' expectations in hip and knee osteoarthritis. Qual Life Res. 2020. https://doi.org/10.1007/s11136-019-02403-6

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